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POPULAR MECHANICS MAGAZINE



WRITTEN SO YOU CAN UNDERSTAND IT

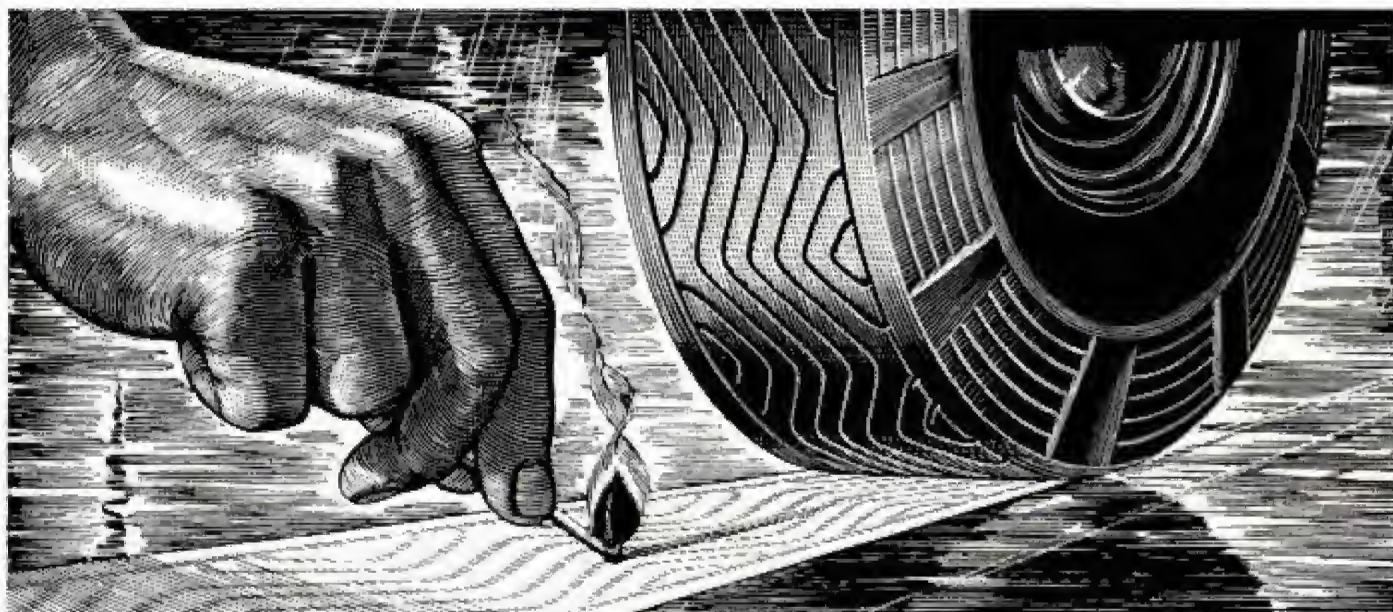
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**SEE PAGE
703**

Secrets of a WORLD CHAMPION PITCHER

NEW TIRE SWEEPS WET ROADS SO *DRY* YOU CAN LIGHT A MATCH ON ITS TRACK



How This Road-Drying Tire Gives You QUICKEST NON-SKID STOPS Ever Seen

● Sensational? You bet! For here at last is a tire that *automatically* sweeps wet roads so dry that you can actually *light matches on its track*—convincing proof that the new Goodrich Safety Silvertown will give you the quickest non-skid stops you've ever had!

Non-skid tests made by the independent Pittsburgh Testing Laboratory, against *regular* and *premium-priced* tires of America's six largest tire manufacturers, including *new* tires

which have recently been introduced, proved that *no tire tested* came up to this new Silvertown in non-skid action.

And whether roads are wet or dry, Goodrich Silvertowns at *all times* have that other great life-saving protection—the famous Golden Ply—to safeguard you against dangerous high-speed blow-outs. See your Goodrich Dealer or Goodrich Silvertown Store about these life-saving Silvertowns now. *There is no extra cost!*



The new **Goodrich SAFETY Silvertown**

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Facts Show It— Owners Know It

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with coil springs—standard equipment *on all models*.

The only low-priced car with a completely rust-proofed Safety-Steel body.

And Plymouth is the only low-priced car with steering-post gear shift standard in De Luxe models at *no extra cost*.



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—DELIVERED IN DETROIT, including front and rear bumpers, bumper guards, spare wheel, tire and tube, foot control for headlight beam with indicator on instrument panel, ash-tray in front and rear, sun visor, safety glass and big trunk space (19.3 cubic feet). Plymouth prices include all federal taxes. Transportation and state, local taxes, if any, not included. PLYMOUTH DIVISION OF CHRYSLER CORPORATION, Detroit, Michigan.

MAJOR BOWES' AMATEUR HOUR, C. B. S. NETWORK, THURSDAYS, 9 TO 10 P. M., E. S. T.

PLYMOUTH BUILDS GREAT CARS

THE "ROADKING"
THE "DELUXE"



AUTOMOTIVE MECHANICS!

Re-Wiring Service is a BIG BUSINESS

Become an Expert!

There is a big demand for expert electrical service. Defective cables and poor connections waste gas, reduce power and pick-up, cause hard starting, and sometimes result in dangerous fires.

You can become an expert at correcting these common troubles. All the information you require is contained in the Certified Re-Wiring Manual, "Copper Nerves"—prepared and produced by the manufacturer of Packard cable. It is the only book of its kind in the field.

FREE



24 pages! 75 illustrations! The Certified Re-Wiring Manual, "Copper Nerves," contains complete step-by-step instructions on checking the electrical circuits for corroded or undersize cable and loose or dirty connections—complete instructions on replacement procedure, using cables of the correct gauge and construction—useful information on other parts of the electrical system. A textbook that will make you an expert! A reference book you can use every day!



BOOST YOUR OWN IMPORTANCE When you have studied the Certified Re-Wiring Manual, fill out the examination blank enclosed and mail to Packard Electric. In return for a passing examination, you will receive a **CERTIFICATE** imprinted with your name. This is your proof that you are a Certified Re-Wiring expert—prepared to give car owners the quality electrical service they need. It is an important job, and it will increase *your* importance.

BRING MORE BUSINESS TO YOUR STATION When you have received your Certificate, have the owner of your station call his Packard jobber. He will give complete details on how to qualify for Authorized Certified Re-Wiring Service. Certified Re-Wiring stations are supplied with metal identification signs, envelope stuffers, steering-wheel cards, and other sales support. It will mean more business for your station—and a bigger job for *you*.

GARAGE MECHANICS AND SERVICE MEN For your copy of the Certified Re-Wiring Manual, send your name, firm name and address, and the name of your Packard jobber to: Packard Electric Division, General Motors Corporation, Warren, Ohio.

Packard

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TRADE MARK

CAR OWNERS—Write for folder explaining Certified Re-Wiring Service. Shows why it pays to get electrical service from mechanics who have received their Certified Re-Wiring Certificate. Packard Electric Division, General Motors Corporation, Warren, Ohio.

THE STANDARD WIRING EQUIPMENT OF THE AUTOMOTIVE INDUSTRY

Popular Mechanics Magazine

H. H. WINDSOR, Founder

H. H. WINDSOR, Jr., Editor and Publisher

May, 1939

Vol. 71, No. 5

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Chemists Outdo Nature

YOU might as well stop worrying about shortages of gasoline and rubber and nitrates in the United States. Lammot du Pont, president of the great chemical company, tells in the June issue how chemists are outdoing Mother Nature in producing the resources this country lacks. We used to depend upon Germany for potash; now we produce it chemically from New Mexico minerals. Japan once controlled a monopoly of camphor; now we make our own from the turpentine of southern pines. Don't miss this authoritative story by Mr. du Pont revealing how chemists are conserving our natural resources and making us secure.

So You're Going to Fly

RIDING into the sunset over pink cotton clouds, you suddenly remember as the stewardess produces a slice of roast beef that you expected to be dizzy or airsick—and you're not! The diary of your first air trip, Newark to San Francisco by sleeper plane, appears in next month's issue with eight pages of Coloroto pictures taken on board a great sky liner.

Next Month

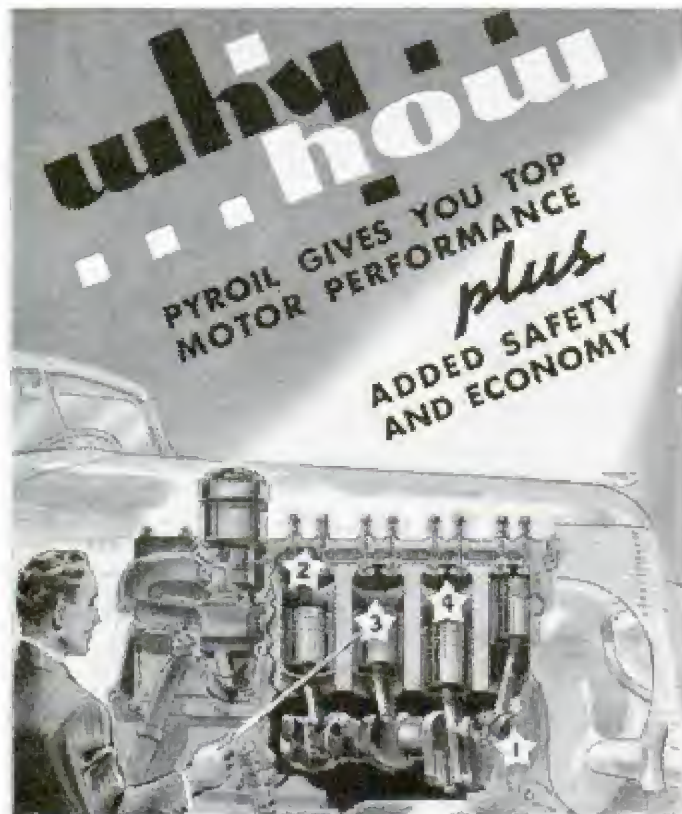
FIFTEEN minutes from death on a storm-lashed Siberian lake. Fog-bound with a Japanese airplane pilot between mountains in China. Medicine man to a strange people living high in the Caucasus—people who had never seen a wheel. Adventure? That's the principal by-product of Julien Bryan. His business is taking pictures around the world. You'll taste some of the thrills he has experienced in his "Adventures of a Roving Cameraman," Part One of which will be printed next month.

Diving Past Deadline

BACK in 1915 a diver went down 306 feet in Pearl Harbor, Honolulu, to reach the sunken submarine S4. Beyond that deadline no diver would go, despite the lure of \$2,000,000,000 in sunken treasure and the demands of deep-sea rescue work. Beyond that came the "bends," dread aftermath of pressure too quickly withdrawn. But today the deadline is thrust back. Helium has defeated the "bends." Read "Below the Ocean's Deadline" in the June issue.

Saving Our Nile

AMERICA'S Nile valley was re-turning to desert. Flood, drought, erosion, encroachment of salt water from the Pacific threatened the rich fruitlands of central California with death. But rescue is on the way with a \$170,000,000 reclamation project including Shasta dam, more massive than Boulder, higher than Grand Coulee dam. The story of this vast undertaking will appear in June.



There's no secret to the manner of Pyroil's efficiency. Pyroil is a *super* lubricant composed only of the finest, purest lubricating elements. Merely a few ounces are needed in the gasoline tank, also the crankcase of your car.

Then, coming in contact with (1) bearings and crank shaft, Pyroil's slippery film adheres ruggedly to the metal. Unlike the regular lubricant, this Pyroil film does not drain away. It withstands greater "shock load," higher temperature. Greatly reduces friction. These features markedly reduce wear on the metal.

In the engine head, Pyroil breaks up hard carbon and gum deposits on (2) valves and (3) rings. This defeats conditions that waste power and consume oil. Wear on (4) piston and cylinder wall surfaces is likewise measurably decreased. And, throughout the whole engine Pyroil prevents dangerous corrosive (acid) attack.

Pyroil costs only pennies. Yet it saves dollars in operation expense. It gives you top motor performance. Try Pyroil today. Sold everywhere. Manufactured and Guaranteed by Pyroil Company, W. V. Kidder, Founder, 55 Pyroil Bldg., La Crosse, Wisconsin, U. S. A.

FREE — Interesting and important Booklet, "Questions and Answers." Whether your car is new or old, this Booklet tells you how to save money in its operation. Mail coupon below.



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GAS & OIL

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F I S H E R F A C T S



WIDER VISION for greater safety! The total window and windshield area of De Luxe Six and De Luxe Eight Pontiac four-door sedans (illustrated) is 412 square

inches larger than last year, includes a 30% larger windshield. Also, the rear view mirror is more efficiently placed and the rear window post eliminated.

The Inside Story of SAFETY in the 1939 BODY by FISHER

BUILD a steel body as solid and weave-proof as possible — you still can't assure its passengers complete protection, until you've made it *safe inside*, too!

That's why Fisher engineers took such great care with the interiors they built for the new General Motors cars — why they gave the new Body by Fisher a *new visibility* as well.

You can see in the illustration above what a broader outlook you get — for bringing overhead traffic lights into easy view, for providing a better picture of the traffic situation on both sides and behind, for giving passengers wider vision, as well.

And to add to this inside

story of safety, all Ventipanes are fitted with locks to protect the car and its passengers from intrusion.

Likewise in comfort, the 1939 Body by Fisher leaves nothing undone. Its interiors have more ride-easy roominess—front and back. What's more, improved Fisher No Draft Ventilation now makes it easier than ever to control the circulation of fresh air to suit yourself.

While as for style, just take a look at any of the new General Motors cars—the only cars with Unisteel Turret Top Body by Fisher.



BODY BY FISHER

ON GENERAL MOTORS CARS ONLY:
CHEVROLET • PONTIAC • OLDSMOBILE • BUICK
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3-IN-ONE OIL

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WHERE DO YOU GO FROM HERE?

YOU'RE like a million other men—you're facing a big question. The depression turned business topsy-turvy and now the rebuilding period stares you in the face.

Are the things that are happening today going to help or hinder you—what will they mean in your pay check? Where will they put you five, ten, twenty years from now? How can you take full advantage of this period of opportunity?

We believe you will find the answer here—a suggestion the soundness of which can be proven to you as it has been to thousands of other men.

The whole trend today—legislation, spirit, action—is to put men back to work, raise earning and spending power, *give every man a fair chance to work out his own salvation.*

The road to success remains unchanged but, bear this in mind, *what it takes to win is radically different!*

No employer today would dare risk an important post in the hands of a man who had not learned the lesson of '29. Why should he, when right at this moment he can pick and choose and get almost any man he wants at his own price?

Business organizations are rebuilding—reorganizing for the new conditions. Before it is over every man and every method will be judged in the cold light of reason and experience—then dropped, re-made or retained. This spells real opportunity for the man who can meet the test—but heaven help the man who still tries to meet today's problems from yesterday's standpoint! Out of the multitude still

jobless there are sure to be many frantically eager to prove him wrong and take his place.

Some Men Have Found the Answer

Seeing these danger signs, many aggressive men and women are quietly training at home—are wisely building themselves for more efficient service to their employers.

You naturally ask, "Has your training helped men withstand conditions of the last few years?"

Our answer is to point to a file of letters from many of our students reporting *pay raises and promotions while business was at its lowest ebb*—together with a myriad of others telling of greater success during these recent months of recovery.

Unusual evidence is ready for your investigation. We have assembled much of it in a booklet that is yours for the asking, along with a new and vitally interesting pamphlet on your business field.

This is a serious study of the possibilities and opportunities in that field. It is certain to contain an answer to vital questions bothering you today about your own work and earning power.

Send for these booklets—coupon brings them free. Be sure to check the LaSalle training that interests you most. We will tell you also how you can meet and take fullest advantage of today's situation. No cost or obligation—so why not mail the coupon now?

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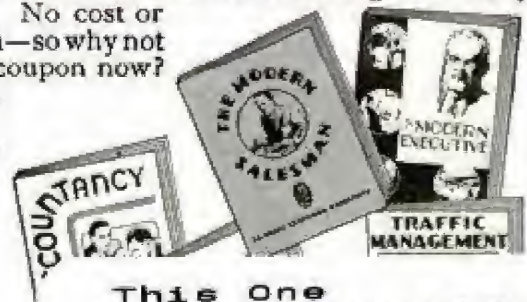
Please send me—without cost or obligation—full information about how I can, through your training, equip myself for the new problems and opportunities in the business field I have checked.

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BE YOUR OWN FIXER AND SAVE THE REPAIR MONEY

Typical repairs that can be made perfectly with Smooth-On:—Stopping leaks in steam, water, gas, oil or stove pipes; mending cracks, breaks or leaks in furnaces and boilers, radiators, tanks, sinks, pots and pails; making loose handles tight on umbrellas, knives, hammers, brushes, drawers, etc.; tightening loose screws, hooks, locks, door knobs, etc.

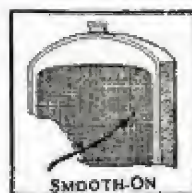
On the Automobile:—Making cracked water jackets and pumps good as new; stopping leaks in radiator, hose connections, gas tank and gas, oil and exhaust lines; making a fume-proof joint between exhaust pipe and tonneau heater; tightening loose headlight posts; keeping grease cups, hub caps, and nuts from loosening and falling off, etc.

Practically every householder spends at least \$10.00 to \$50.00 each year and many spend several times that much on the above and other simple repairs that can be made quickly, easily and well with Smooth-On No. 1.

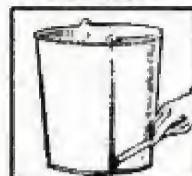
With a can of Smooth-On you can save this money in your own home—and by doing similar repair work for others, you can make money.

No skill is required to make repairs and the amount of Smooth-On used on any one job seldom costs more than a few cents. To get perfect results, write to us for and

use the Smooth-On Repair Book. Get the booklet from us and Smooth-On No. 1 in 7-oz., 1-lb. or 5-lb. tins from any hardware store.



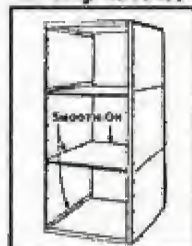
Smooth-On
Radiator



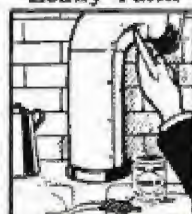
Leaky Pail



Leaky Kettle



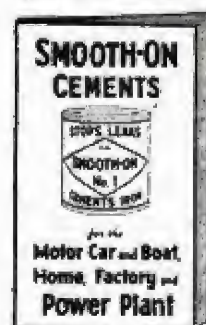
Leaky Tank



Stove Pipe



Oil Leaks



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Do it with **SMOOTH-ON**

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IMPORTANT NOTICE

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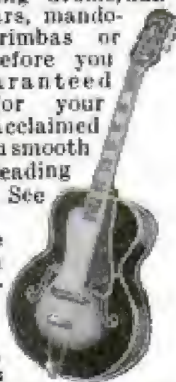
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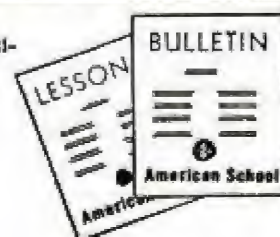
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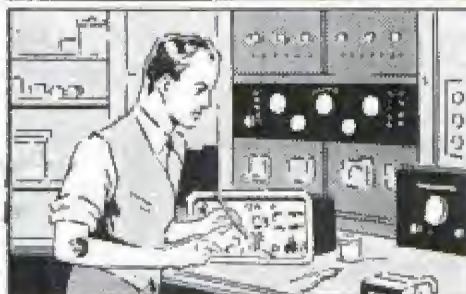
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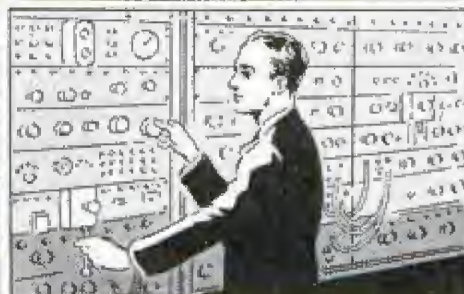
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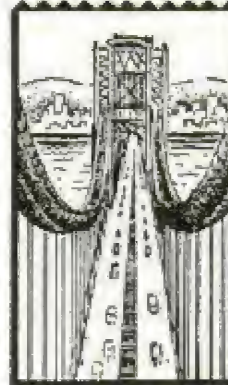
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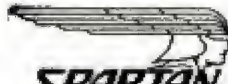
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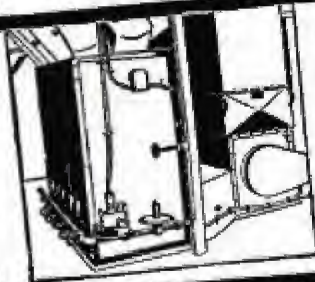
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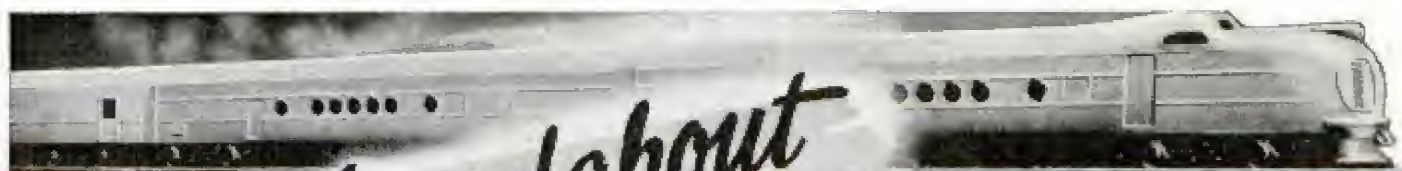
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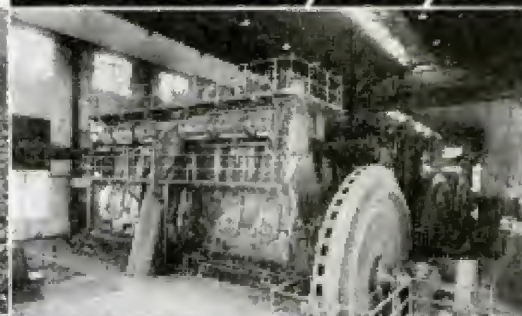
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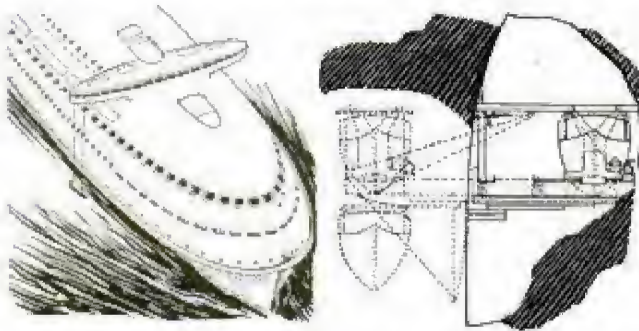
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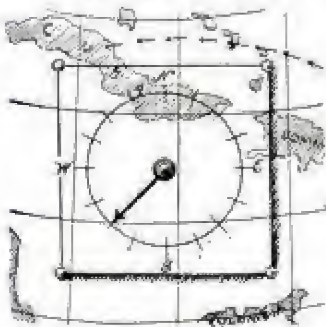


J 203
GREATER safety at sea is the purpose of a lifeboat unloading arrangement patented some time ago. It is intended for a ship having a system of interior decks within an inclosed hull and superstructure, of the streamline design. The lifeboats would be moved on rollers out to the end of a part of the superstructure constructed



at right angles to the main portion of the ship. From that point, the lifeboats would be lowered to the deck level to be loaded, then swung down to the surface of the water. Loading would be through a door at the deck level. This manner of handling is intended to prevent damaging the lifeboat by contact with the side of the ship.

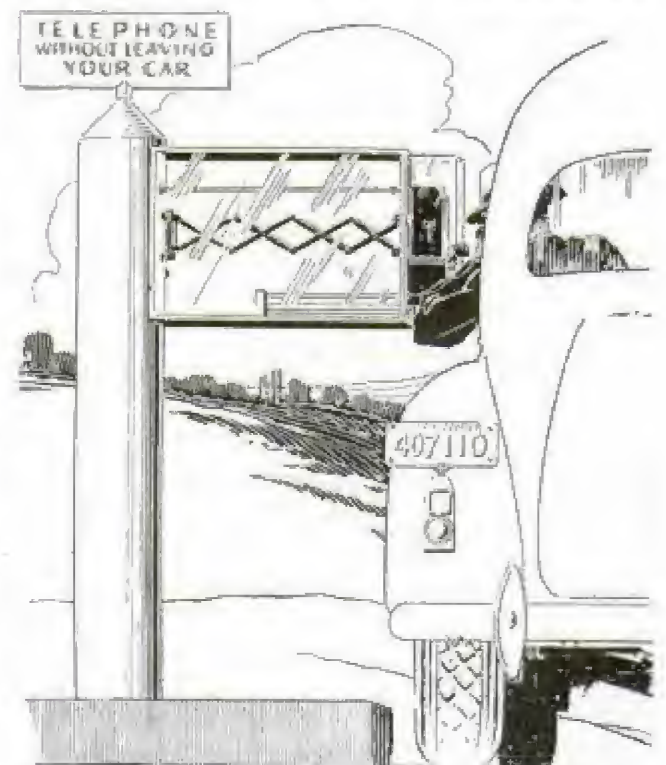
DESIGNED to speed up location of a storm center, a new meteorological instrument has been patented. It comprises a supporting member having points of the compass indicated thereon and disposable upon a map in corresponding relation



to the North direction on the map, with its center at a given observation point. The instrument has means for indicating the direction of the wind and for indicating

graphically the proper barometric reading at a given point. Wind and barometer indications form two legs of an angle, the angle being fixed for any particular barometric reading. The projection of the second leg intersects a previously plotted line indicating the known or probable course of a storm so that the point of intersection will indicate the approximate location of the storm center at any given time.

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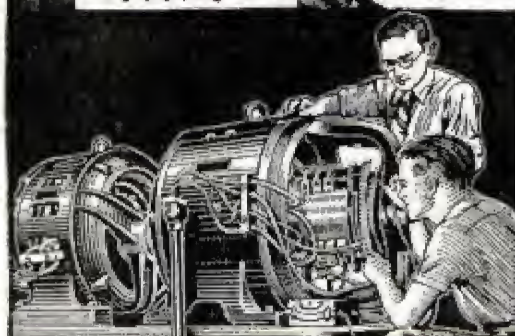
is fitted with an extensible carrier so that it may be pulled into the car while in use. Standard coin operation would be used.

(Continued to page 24A)

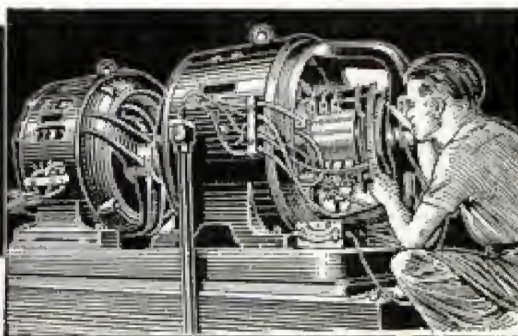


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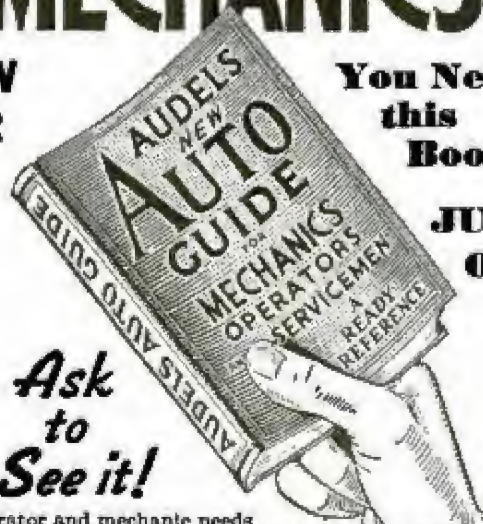
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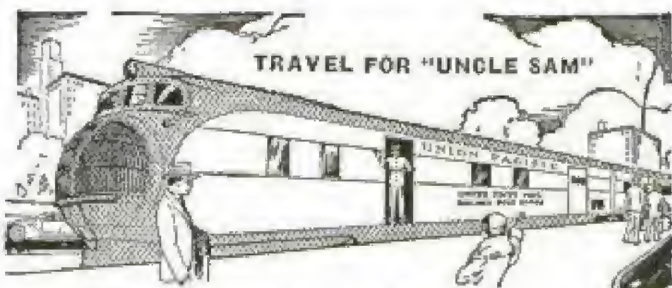
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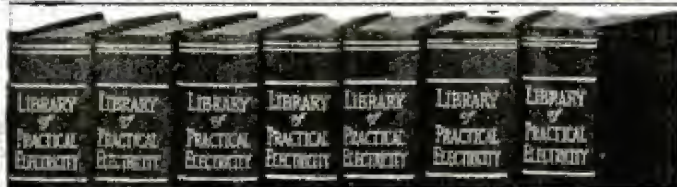
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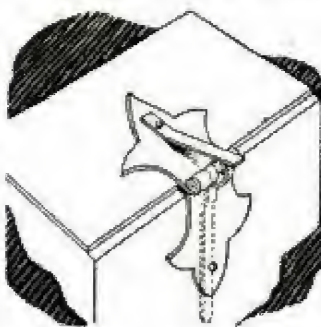
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NEW INVENTIONS

(Continued from page 18A)

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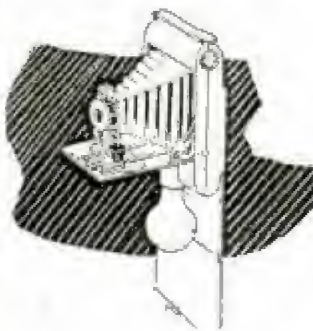
use. It is a means of closing tightly the covering flaps of the carton, thus keeping the contents sanitary and free from dust. It also affords protection from atmospheric

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FOR the convenience of the camera fan, the latest invention combines camera and flash lamp, with suitable mechanism for operation of flash and shutter at the same time. The lamp socket is built into the underside of the camera.



Due to the fact that many of the devices described in this department are still in the patent office stage and are not on the market, Popular Mechanics Magazine cannot undertake to supply further information regarding them.

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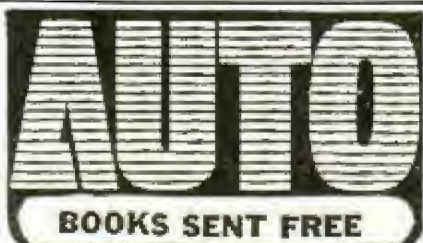
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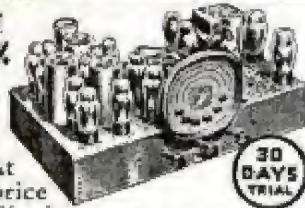
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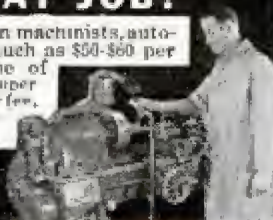
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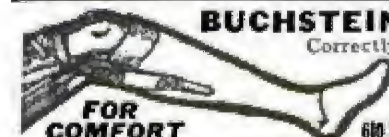
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SAVE Half! Guaranteed reconditioned truck and auto parts. All models, makes. Catalog free. Salesmen wanted. General Auto, 7008AA Cottage Grove, Chicago.

BEARINGS—Piston rings. All makes, sizes; ball, roller, thrust. Big discounts. List 10c. Kostka, 2350 South Crawford, Chicago.

BATTERY Drain detector. Connects to ammeter terminal and automatically lights red dash light if any switch is left "on" after motor is stopped. Universal. Complete \$2.50. Redlite, Plain, Wis.

COLLISION Feeling! What's your defense? Seco, the automatic synchronized, warning flicker! New 1939! Your stop light always signals differently when slowing down or stopping. Attach Seco behind speedometer quickly. Send \$1.00. State car and year. Smith Engineering Co., 197 Brunswick, Buffalo, N. Y.

NEON Stoplight penetrates fog, easily installed by anyone. Complete with 21" neon tube \$3.00. Complete kit for use with model T Ford coil \$1.75. Complete plans and information 25c. Bohlman, 125-19 Jamaica Ave., Richmond Hill, N. Y.

REFINE Used oil without cost. Particulars. F. Gerwin, Fairview, Oklahoma.

RE-REFINE Crankcase drainings, request information. Zelball, Mount Holly, N. J.

PLATING Outfits for auto parts. Connect to a battery. No tanks used. Free particulars and proofs. Gunmetal Co., Ave. J, Decatur, Ill.

ACETYLENE Welding outfits, \$32.95; electric welders, \$74.95. Easy-payment plan. Box 331, Hamilton, Ohio.

MOTORCYCLES, BICYCLES, MOTOR SCOOTERS AND SUPPLIES

MOTORIZED Vehicles. How to build five different scooters. Harley engined Flea airplane, one wheel bicycle Diesel conversion, motorcycle trailers, midget racers, etc. No pictures, but working drawing, blueprints, etc. Large book \$1.00. C.O.D. \$1.25. Refund if dissatisfied. Kamm Metal Products Company, 162 High Street, Oshkosh, Wisconsin.

BUILD Your motorscooter. Complete steel kit \$3.95, dollar construction plans free. Illustrated parts catalog 20c. Midwest, 1-C, Box 1959, Chicago.

MOTORCYCLE Cylinder boring \$2.00. Aluminum pistons, stock or racing, all models, (dealers supplied). New and used Indian parts. Used motorcycles. Stamp brings list. Phila. Indian, 1635 Hunting Park, Philadelphia, Penna.

ALLOY Pistons \$3.00—Harley, Indian, Henderson, Excelsior, Cleveland. Cylinder grinding, motor rebuilding. New and used parts for less. Catalogue and wings pin 10c. Ballak, 1115 Chestnut, St. Louis, Mo.

SEND 10c For 1939 Handbook of Information just printed. New and used parts, accessories for Indian, Harley, Henderson, Excelsior. Valuable information on motorcycle rebuilding. Bootz, 622 East Grand, Des Moines, Iowa.

MOTORCYCLES, Reconditioned. New, used, parts and accessories. All makes, Large stock, Bargains. Illustrated catalog, 15c. Indian Motorcycle Sales Co., Kansas City, Mo.

MOTORSCOOTERS! Save \$30-\$60 building latest, easiest built scooter. Steel kit \$3.95, plans free. Complete illustrated catalog 20c coin. Midwest Motors, Box 1959, Chicago.

NEW Push-A-Bike outboard motor for your bicycle. Complete with pneumatic tire, Ready to attach. Richburn Company, Aurora, Missouri.

MOTORCYCLE Parts and accessories, new and used, for all makes and model motorcycles. Write for prices. Triangle, 1111 Washington, Chicago.

MOTORSCOOTERS! New design. Build yourself—easily. Plans, instructions, 25c. Shipps, Box 543-H, Zanesville, Ohio.

BUILD Power scooters, midget cars. We supply tires, wheels, motors. Lowest prices. Send 10c for plans, etc. Build-Of-Own Devices, 5238 Lake, Chicago.

REBUILT Motor cycles, all makes, new and used Harley-Davidson parts. Send 10c for bulletin. Western Harley-Davidson Distributors, 914 E. 15, Kansas City, Mo.

MOTORCYCLE Bargains, lowest prices, bargain sheets for stamp. Motorcycle accessories. Rochester Harley Davidson Corp., 129 W. Main St., Rochester, N. Y.

HI-LIFE Bicycle generators operate lights direct or charge miniature Kic-O storage battery. Write Kimley, 1271 E. Ferry, Buffalo, N. Y.

INSIDE Dealer prices. Overstocked, all models, Indians and Harleys. Rebuilt, guaranteed. Dime brings latest list. Crandall-Hicks, Boston, Mass.

RECONDITIONED Motorcycles. New—used parts for all makes. Authorized Harley-Davidson dealer. Whitman Motorcycle & Supply Co., 405-9 Southwest Blvd., Kansas City, Mo.

AVIATION

GET Into aviation. Pilots earn up to \$6000 a year! Airplane mechanics and aeronautical engineers also get big pay! Prepare at this Lincoln government approved school. Write for complete information. Lincoln Airplane & Flying School, 2004 Aircraft Bldg., Lincoln, Nebraska.

AVIATION Apprentices — Air-minded young men interested in training for entering aviation as apprentices see ad on page 22A.

150 AIRPLANES \$50 Up. Terms, trades. Complete catalogue 25c. Used Aircraft Directory Athens, Ohio.

AIRCRAFT Mechanics, welding, flying courses. Swallow Airplane Company, Wichita, Kansas.

JUST Out. Practical course in flying. 29 chapters, illustrated, complete. Only \$1.00. Aircraft Directory, Athens, Ohio.

PROPELLERS For sleds, aircraft. Catalog 10c. Banks Propellers, Love Field, Dallas, Texas.

PROPELLERS For airplanes, sleds. Ice-sled blueprints, supplies. Catalog dime. Lorenzen Propellers, Niles, Michigan.

PROPELLERS—All types, including latest three blade airliners. American Flea Special \$12.50 down. Universal Aircraft, Ft. Worth, Texas.

AIRPLANE Mechanic's home-study course \$1.25. Engine Mechanic's \$1.25. Both courses \$2.00. Prepares for license. Helps pilots immensely. Meyer Engineering, Hempstead, N. Y.

LEARN To fly free. Folder, dime. Ohmeyer, Box 391, Hempstead, N. Y.

A. C. GENERATORS

PRACTICAL Changes for automobile generators. See our advertisement at bottom of page 142A. Autopower.

BATTERIES, GENERATORS, ETC.

FARMLITE Batteries—40% discount. Buy direct. 32 and 110 volt light plants. York Battery Co., York, Penna.

PLATING Generators and motor generator sets. Write for information Hobart's new line electro plating equipment. Payments low as \$12.40 monthly. Quality machines, quick delivery guaranteed. Hobart Bros., Box M-592, Troy, Ohio.

LOOK! Save 50-75% on all type wind-chargers, batteries, generators, propellers—through our "Cooperative Wind Electric Association." Dime brings membership and valuable wholesale catalog. Kubat Mfg., St. Paul, Minnesota.

12 VOLT Heavy duty generators \$8.50. Save money on new, used automotive electrical parts: free catalog. State Ignition, 52 Cullerton, Chicago.

50-1½ HORSE. Repulsion induction, 110-220 volt, heavy duty motors, 3400 speed, \$9.75. Also generator bargains. Electrical Surplus Company, 1885 Milwaukee, Chicago.

12 VOLT Airplane generators, new, complete, closeout. \$3.95. Air Transport, Garden City, N. Y.

EDISON Storage batteries for light-power systems. Non-acid. Odorless. Fifteen year life. Five year unconditional guarantee. Bargains in complete lighting systems. Low prices. Free illustrated literature. "See-Jay" Battery Co., 82 Sterling Ave., Yonkers, N. Y.

EDISON Lifetime storage batteries for light and power. Eliminates acid battery diseases. Long guarantee. All kinds rebuilt generating plants, motors, and miscellaneous articles at bargain prices. Free interesting literature. T. Hawley Smith Co., Croton Falls, N. Y.

ELECTRICAL SUPPLIES, EQUIPMENT

BARGAINS—Arc welders, also motor generator. Write for new bargain list telling needs. Hobart Bros., Box M-597, Troy, Ohio.

ELECTRIC Shavers—Guaranteed one year, 110 a.c.-d.c., \$3.50. No C.O.D. orders. Hamilton Sales, Takoma Park, Maryland.

MAGNET, Alnico, new wonder alloy lifts 50 times own weight. 60c; large \$1.00. Advance, 861-P8 Minneapolis, Minn.

TUNGAR Bulbs \$1.65 postpaid. Genuine G. E. 2½ amp. Full wave type. E. B. Lewis, Southington, Conn.

ELECTRIC Engraver, engraves all metals deeply, dollar. Hudson Bros., East Syracuse, N. Y.

ULTRA Violet—Infra red. Dual ray health lamp. Two separate units in one. Promotes sun tan—vitamin "D". Automatic control, AC-DC current. \$3.90 postpaid. Details. Beyer Mfg. Co., 4515-P Cottage Grove, Chicago.

ELECTRO-SCRIBE: Electric pencil writes, engraves all metals. \$1.00 postpaid. Details. Beyer Mfg. Co., 4515-K Cottage Grove, Chicago.

ELECTRIC FENCING

MAKE Electric fence from old automobile coil. Complete plans 10c. No extras to buy. LeJay Manufacturing, 947 LeJay Building, Minneapolis, Minn.

WELDING AND SOLDERING

DODGE Arc-welder, 25-125 amperes, 0-40 volts d.c. (Two Dodges 25-200) built from North-East 12 volt automobile generators without rewinding armature. Plans \$1.00. Welders Club, AB-3432 M-Mart, Chicago. Special: "44 Lessons in Arc-welding" 50c (foreign 75c).

WELDERS Take notice! For \$1.10 we can furnish a new field and specifications. How to make big money with your welder. Zemans Radio Elec., Wa Keeney, Kansas.

DODGE Generator makes 150 amp. arc-welder. Two make 300 amp. No armature rewinding. Instructions 50c. Practical Methods, St. Paul, Minn.

ARC-WELDING Outfit \$1.25. Weld fenders, brake, solder. Arrowtrading, 5014 Tillman, Detroit.

75-200 AMPERE Arc welders from Dodge generators. Complete plans 35c. 100 other generator changes. LeJay Manufacturing, 347 LeJay Building, Minneapolis, Minn.

DELCO Arc-welder, 25-200 amperes d.c., 0-75 volts, built from 32 volt light plant. (No rewinding.) Plans \$1.00. Welders Club, AB-3432 M-Mart, Chicago.

PLANS For 110v arc welder. 50c. Marvelweld, Box 1156, San Francisco.

BUILD Your own a.c. arc welder, 115 or 230 volts. Send stamped envelope for circular. 474 Summer Ave., Newark, N. J.

POWERFUL 110-220 Volt a.c. welder constructed for less than \$5.00 uses starter coils. No winding. Pole transformer makes 200A. welder. Plans \$1.00. Information dime. Welders Supply Co., Box 132, Bellefontaine, Ohio.

NEW Arc welder cheap. Free literature. Holcerson's Service, Canton, Kansas.

DEMONSTRATORS, Electric arc welders. Money-saving prices. Used by the government. Trial and terms guaranteed. Hobart Welders, M-593, Troy, Ohio.

ALUMINUM Solder, 25c postpaid. Hammond, 120 W. Susquehanna, Philadelphia, Penna.

REBUILT a.c. d.c. Arc welders, all sizes; engine governors, idlers. Terms. Low prices. Guaranteed. Service Co., 3732 Cedar Ave., Cleveland, Ohio.

APOLLO 110 Volt electric brazing torch. A.C.-D.C. Produces 3 inch flame similar to acetylene. Welds, brazes, solders all metals including aluminum. Literature free. Apollo Mfg. Co., 634 Union, Memphis, Tenn.

ARC-WELDER 25-500 Amperes d.c., 0-75 volts, built from d.c. vehicle motors. (No rewinding.) Plans \$1.00. Welders Club, AB-3432 M-Mart, Chicago. For sale: New and used d.c. vehicle motors.

ENGINES, MOTORS, DYNAMOS

300 MOTOR Diagrams and tables covering three phase: Star, Delta, nine lead, two and four speed; two phase: single phase: split phase, capacitor, repulsion induction, fan, armature windings, etc. Satisfaction guaranteed or money refunded. \$1.50 prepaid. Educational Advancement Company, Lakewood, New York.

25 AND 60 Cycle rebuilt motors. Fully guaranteed, priced to sell. Sommers Electrical, Tavistock, Ont., Can.

ALTERNATING Current motors, grinders, drills, exhaust fans, radios, clocks, shavers, appliances. Home workshop tools. Bargain pricelist free. Mallorder Electric, 713 South Dearborn, Chicago.

BARGAINS—Plating generators, motor generator sets, also arc welders. New low prices for large and small shops. Trial—easy terms if desired. Hobart Bros., Box M-596, Troy, Ohio.

PRECISION Double action steam engine \$2.00. Ready to run. 50 to 4000 r.p.m. Send stamped addressed envelope for description. Pruett Novelty Wks., 1828 W. 43rd Place, Dept. 6, Los Angeles, Calif.

FOR Sale. Small elect. motors with flexible shafts, rebuilt \$3.25 postpaid. McConnell, 1619 Edgewood Ave., Racine, Wis.

MAKE Money, rewind auto generators, washing machine motors, construct arc welder. 10c brings particulars. Catalog material. Ernest Knight, LaSalle, Illinois.

5 KVA Alternators \$125.00; also larger sizes. Motors, generators. Queen City Electric, 519 South California, Chicago.

BARGAIN—½ Hp. motors, 60 cycle, 1 phase, 110 volt, like new, guaranteed, \$7.40. Send check to Erie Electric Motor Co., 120 Church, Buffalo, N. Y.

MOTOR Winding lessons, illustrated. Send stamp for particulars. Also motor data for experienced winders, introductory selection \$1.00. Motor Data Company, Box 7631, Kansas City, Mo.

ALTERNATING, ½ Horse, 110 volt, induction motors. Rebuilt, guaranteed, \$7.50. Wilmut Auto Supply, 2247 St. Paul Ave., Chicago.

MACHINERY, TOOLS AND SUPPLIES

DRILL Grinding attachment fits bench grinder, hand or power turned. Handles sizes 3/16 to 1¼". Price \$7.85. Descriptive literature on request. Tractor-Lite Co., Sidney, Iowa.

CASTINGS, Drill press vise \$1. Lathe grinding attachment \$2.50. R. Baumgartner, 400 N. 2nd, Corvallis, Ore.

NEW Catalog! Lathes, motors, spray equipment, jig saws, drill presses, supplies of all kinds. Enclose 5c. Balko, 605-R Washington, Chicago.

BARGAINS, Demonstrators, electric arc welders, guaranteed, 30 days trial and terms. Write Hobart Welder Exchange, Box M-594, Troy, Ohio.

KELLOGG Air compressors, \$6.00. Electric refrigerators, \$25.00. Vacuum pumps. Taylor, 105 East 102nd Street, New York.

CONCRETE Building block machines and molds. Easy payments. Catalog free. Concrete Machine Co., 5129 South Compton Ave., St. Louis, Mo.

LAWN MOWER Parts catalog, new sharpening clamp. Write: Collet Supplies, Miami, Florida; Hosse & Hosse, Nashville, Tenn.; Malaban, 1207 Bedford Avenue, Brooklyn, New York.

TURRET Type boring tool holder with 1½x6" and 3¼x9" boring bars \$8.50. Collet chuck sets \$13.50. Circular free. Northwest Tools, Box 1486, Boise, Idaho.

TREMENDOUS Surplus of factory tools selling out. Drills, taps, files, hacksaws, etc. Send for free lists. Include six cents postage. Travers Tool Co., 264 Jackson Ave., Long Island City, N. Y.

AIR Compressors, new 13½x1¼, \$6. 2x2 \$7. 2½x2 \$8. Guaranteed. Send check or money order. National, 560 Washington, Chicago, Ill.

14" x 6" GREAVES Klusman cone head engine lathe, quick change. No. 0 Cincinnati miller, cheap. Write for particulars. Cincinnati Machinery & Supply Co., 221 E. Second St., Cincinnati, Ohio.

BOATS, OUTBOARD MOTORS, ETC.

OUTBOARD MOTORS. \$25.00 buys new 1.2 h.p. magneto ignition, weight 17 lbs. Troll fishing or pleasure motor. Dime for catalogue with parts, prices and operating instructions. Outboard, 305 Atlantic Ave., Boston, Mass.

MARINE Reverse gear easily converted from auto transmission 80% reverse. (Not model T Ford.) Instructions and plans \$1.00 postpaid. Speed Specialties, 629 10th St., Oakland, California.

OUTBOARD MOTORS. All makes of used motors and parts. Outboard Headquarters, 315 Atlantic Ave., Boston, Mass.

BUILD A boat by the Welch System. Its inexpensive; interesting and profitable. Everything for building, equipping or repairing boats. Use Welch Ready Cut Parts. Send 10c for catalog showing boats of many types; boat hardware; propellers; marine paints; sails; boat finishing materials and Welch White Cap marine motors. Welch Boat Company, Station K-1, Milwaukee, Wisconsin.

DUXBURY Dinghies and prams—\$35.00 up. Weldwood construction. Duxbury Boats, Duxbury, Mass.

BUILD Your own boat with Bay City Prefabricated frames and materials. Save up to 2/3s. Lumber, fittings, engines and equipment. Send requirements for quotation. Illustrated catalog 100 boats 9 to 65 feet 10c. Bay City Boats, Inc., 1552 Adams St., Bay City, Mich.

PROPELLERS. Gear pumps, stuffing boxes, bearings, etc. Wm. Baker, Pond St., Quincy, Mass.

ASSEMBLE Your own boat. Our finished knock-down frames and materials save you 2/3 builder's cost. All types and sizes. Send 25c for big catalog. Brooks Boat Co., Inc., D4, Saginaw, Mich.

OUTBOARDS — Save 1/2. Good used parts, all makes and models. Bargains rebuilt motors. Grandall Hicks Co., 959 Commonwealth, Boston, Mass.

12 FOOT Flat bottom rowboat, complete plans 25c. Free boatbuilding catalog. The Rudder, 15 Murray St., New York.

FORD-ZEPHYR Marine conversions. Catalog 10c. Lehman Engineering Company, Dept. D, Newark, N. J.

BOAT Designers are highly paid professionals. Complete course by mail. Catalog. Westlawn, Montville, N. J.

SEE Our display ad on page 153A. Cleveland Boat Blueprint Co., Station A-66, Cleveland, Ohio.

SPORTING GOODS, GUNS, FISHING TACKLE, ARCHERY

MEN! Hand-made wristwatch straps, guaranteed sweatproof, finest genuine calf leather, outlasts others 4 to 1. Regular \$2.00 value. Special introductory "Maker-to-You" Offer only \$1.00. Western Leathercrafters, Box 3493, Portland, Ore.

LIFELIKE Imitation baits, angleworms, grubs, helmsmites, etc. Hollow rubber using filler proper color. Dozen baits, two large tubes filler \$1.00. Peters Company, Dept. M, Whittier, Calif. Attractive for agents.

NATIONALLY Known fishing tackle delivered at big discount. Catalogue free. Tackle Store, Sac City, Iowa.

BOWS. Arrows, raw materials. Lowest prices. Lloyd Morrison, Waldport, Oregon.

GOLF Clubs. Five club matched set \$2.50. Lincoln Surplus, 123 Galena, Freeport, Ill.

FREE 1939 Fly tying material catalog. Work Fly Company, Pueblo, Colorado.

GUNSMITHING Learned at home. Repair personal and neighbor's firearms. Free catalog 20 firearm and gunsmithing books. Thomas Samworth, Marines, North Carolina.

TENNIS Strings, gut and synthetic at tremendous discounts. Samples free. Crescent, 2535 Patricia, Los Angeles.

RIFLES. Shotguns, target pistols, air rifles, hunting knives, binoculars, telescopes, cameras, police goods, badges, holsters, etc. Bargain catalog 3c. Lee Sales, (Dept. W), 35 West 32nd St., New York.

TREASURE Finders? Read Goldak advertisement on page 137A.

BARGAINS! Gun catalog 5c. Fishing catalog 5c. Ski catalog 5c. J. Warshaw & Sons, First and Madison-PM, Seattle, Wash.

BOWS, Arrows, raw materials. Beautiful catalog (over 125 pictures) and "Essentials of Archery" a handbook on making bows and arrows 35c. Everyone intending to make their own should have this manual. Instruction folder and catalog 10c. L. E. Stiemmler, Queens Village, N. Y.

SINKER Molds for making your own sinkers. Free illustrated folder. Reading Instrument Co., Box 78, Reading, Penna.

ARCHERY Headquarters—617 South State, Chicago. Catalogue free. Complete instruction book 50c.

HUDSON Bay blankets, Indian pack baskets, camp stoves, knives, compasses, outdoor equipment. Free catalog. Howe Fur Co., Box P, Coopers Mills, Maine.

MUSCLE Building course 25c, large size \$1.00. Sid's System, Southgate, California.

FIELD GLASSES, TELESCOPES AND MICROSCOPES

TELESCOPES. Microscopes, binoculars; 1939 bargain catalog free. Brownscope Co., 5 West 27th Street, New York.

TELESCOPES—New, used \$5.00 up; amateur kits, Pyrex, 4" \$4.50; 6" \$5.50; 8" \$10.00; 10" \$15.00; 12" \$24.00. Also parts, accessories, mounts, astronomical books, maps. Panero aluminizing. Microscopes 20X 95c; 60X \$1.95; 200X \$2.95; 250X \$3.95; 500X \$5.95. Astronomical jig saw puzzle \$1.00; map for puzzle 75c. Send 10c for catalogue, interesting articles. American Telescope Laboratories, Inc., Dept. 210, Hollywood, California.

EXTRAORDINARY Value—Super power drenchdought field glasses. Will do work of \$10.00 glasses. Guaranteed. Length closed 5 1/4 inches. \$3.00 prepaid. Order today. B&H Sales Co., 56 West Washington, Chicago.

REFLECTING Telescopes—build your own. 6" kit \$3.50; all abrasives, mirrors, eyepieces, diagonal prisms. Illustrated instructions 10c. Catalog free. Optical Development Corp., Dept. G, 1560 Broadway, New York.

BOYS—A powerful telescope for 20c. Have real fun. Send today for free information. B & H Sales Co., 56 West Washington, Chicago.

ANTIQUES, RELICS, INDIAN GOODS

ARROWHEADS. 100 Good or 60 fine \$3.00. Catalog. George Holder, Glenwood, Ark.

ARROWHEADS; Saskatchewan glacial beauties, rainbow variations. Dan McKillop, Regina, Saskatchewan.

SWORDS, Rapiers, pistols, daggers, armor catalog 6c. Robert Abels, 860A Lexington Ave., New York.

100 GOOD Arrowheads \$3. Catalog. 5c. H. Daniel, Hot Springs, Ark.

INDIAN Relics, beadwork, coins, curios, minerals, old glass. Catalog 6c. Indian Museum, Northbranch, Kansas.

TAXIDERMISTRY

MODERN Taxidermist Magazine, Greenfield Center, N. Y. Crammed full with valuable taxidermy information. Three sample copies 25c.

TAXIDERMISTRY Supplies—Quality artificial eyes, teeth, genuine Jonas head forms. Tools, materials, etc. Everything for the progressive taxidermist. Send 10c for big illustrated catalogue. Jonas Bros., 1049 Broadway, Denver, Colo.

DOGS, PETS, BIRDS

A BUNNY Makes a dandy pet. Clean. Low feed cost. Write. Box 135, Gillespie, Illinois.

STANDARD Rabbit Journal, Milton, Penna., year 50c. Sample dime, supplies.

REAL Saint Bernard puppies priced right! Royal Kennels, Chazy, N. Y.

BEAUTIFUL Pure white police dogs. Ansonia Kennels, Mose, N. Dak.

BIRDS? Get American Canary Magazine monthly. Year, \$1.00. 2839-P North Halsted, Chicago.

GREATDANES. Dependable guards, companions. Pups \$25.00. Pictures free. Kalmar Danery, Stone-Mountain, Georgia.

POULTRY AND FARM SUPPLIES

CAN Make immediate delivery on A Grade Reds, Barred, Buff, White Rocks, Wyandottes, Orpingtons, \$7.00—100; pullets \$9.90; cockerels \$6.90; White, Buff, Brown Leghorns, Anconas, \$6.75—100; pullets \$14.50; cockerels \$3.00. 90% accuracy guaranteed on pullet chicks. Supreme matings 75c—100 higher than above prices; all pullet chicks from supreme matings. Write for quantity discount and free catalog. We pay postage, guarantee 100% live delivery, ship C.O.D. Salem Hatchery, Box 81, Salem, Indiana.

FREE Sample poultry magazine. Twelve issues 25 cents. Unexcelled. Poultry Item, Box 71, Sellersville, Penna.

\$3.00—100 FOR Cockerels, Barred, Buff and White Rocks, S. C. Reds, White Wyandottes, Buff Orpingtons, \$7.45—100; pullets \$9.45; cockerels \$6.95; special heavy mixed lot \$5.40. English White, Brown and Buff Leghorns and Anconas \$7.25—100; pullets \$13.90. Assorted \$4.95. All chicks from tested, culled, thoroughbred flocks. Write for quantity prices and free catalog. Davis Poultry Farm, Route 34, Ramsey, Indiana.

5 ALL-EXPENSE Trips to World's Poultry Congress. Write for contest rules and free catalog telling how to make money with Davis chicks. Tom Barron White, Brown, Buff Leghorn, Ancona pullets \$14.90—100; cockerels \$3.00; unsexed \$7.75. Unsexed Barred, Buff, White Rocks, Reds, Wyandottes, Orpingtons, \$7.95—100; pullets \$9.95; cockerels \$7.45; heavy mixed \$8.45; assorted \$5.50. Write for complete price list, Turkey poult and ducks. Davis Poultry Farm, Route 34, Ramsey, Indiana.

MAKE Money with poultry. Read America's leading poultry magazine for latest information. Three years \$1.00; nine months 25c. Poultry Tribune, Dept. E-93, Mount Morris, Ill.

CHICK Raisers make extra money selling our chicks to neighbors. Write Jackson County Hatchery, Box 19, Seymour, Ind.

TREES, SHRUBS, ROOTS, HERBS

COLORADO Evergreens, 25 three year old. We will prepay for \$1.00. Rocky Mountain Evergreen Co., Evergreen, Colo.

JUST Out! World's greatest "Herbalist Almanac." Beautifully illustrated in natural colors. Contains over 200 old-fashioned herb medicine recipes for home use. 10c postpaid. Worth dollars! Botanics, 145 W. 112th St., Chicago.

FARMS AND FARM LANDS

VALUABLE Waterfront, 90 acres, greenhouse 25x45, poultry houses for 1000 birds, basement barn 50x85; rich level fields, river frontage, 2 small private lakes; 7-room home on lovely hill-top location; bay view; catalog price \$1500 cut to \$1200 to close quickly; page 6 new 100-page free catalog. Strout Realty, 255-P 4th Ave., New York City.

GOVERNMENT Lands ten cents acre up. Information all states twenty-five cents. National Tax Service, 690A Majestic Bldg., Detroit, Mich.

FLORIDA Tax deed lands, \$8.00 acre up. Terms. Farming, trucking, fruit growing, fine hunting, fishing. Well located. Florida Tax Deed Service, 8007b Nebraska, Tampa, Florida.

CANADIAN Tax sale lands for a dollar an acre and up. Small monthly payments. Farms, timber, hunting and fishing camps, minerals. Limited number of properties. Write at once for free illustrated booklet. Tax Sale Service, Room 613, 72 Queen St. W., Toronto, Canada.

FARMS That pay in the Great Northern Railway agricultural empire, Minnesota, North Dakota, Montana, Idaho, Washington, Oregon. Fertile black soil, high production crops, grain, fruit, vegetables, feed and livestock. Many kinds of farms for selection. Write for book on state you prefer. E. C. Leedy, Dept. 457, G. N. Ry., St. Paul, Minn.

GOOD Farms available. Washington, Minnesota, Idaho, western Montana, Oregon. Dependable crops, favorable climate. Write for impartial advice, literature and list of typical bargains. Specify state. J. W. Haw, 119 Northern Pacific Ry., St. Paul, Minn.

40 ACRES. Near White River, unimproved; poultry land. \$175, \$5 down, \$5 monthly. Free list and literature. Hubbard, 216 Grossman Bldg., Kansas City, Kans.

FARM MACHINERY AND SUPPLIES

ALL Purpose tractors at factory price. Shaw 2 to 8 horsepower, riding or walking types. Does plowing, discing, harrowing, cultivating; mows lawns, cuts weeds, does hauling; runs belt machinery. Air or steel tires. Three speeds forward and reverse. Thousands in use. Write for free catalog and 10 day trial offer. Shaw Mfg. Co., Dept. PM-5, Galesburg, Kansas.

"PEPY" Governor makes automobile engines into power units. Most sensitive and accurate. Low price. \$9.50 postpaid. Get circular. Harris Machinery, Minneapolis, Minn.

NEW And used tractor parts at tremendous savings. Write for free 1938 catalog. Central Tractor Wrecking, Co., Boone, Iowa.

PROFITABLE OCCUPATIONS

M. M. earned \$267, three weeks, raising mushrooms in cellar! Exceptional, but your cellar, shed perhaps suitable. We buy crops. Book free. United, 3848 Lincoln Ave., Dept. 69, Chicago.

AMAZING Steady income. Angora wool rabbits. Complete instructions 10c. Logangora Industries, Logan, Utah.

RATTLESNAKES. Make money seven ways. Find, capture without danger. Business never overdone. Collector answers all questions \$1.00. Jim Payne, Fabens, Texas.

TREASURE Finders? Read Goldak advertisement on page 137A.

MEN—Women, operate "Specialty Candy Factory" home, all or spare time. Steady income. (Our 29th year.) Hillyer Ragsdale, Inc., Drawer 62, East Orange, N. J.

COUNTRY Drives or movies afternoons! Work mornings home. No canvassing! Folio-H. Station D, Los Angeles.

POSITIONS At sea. Details free. No employment agency. Julius, Amarillo, Texas.

BOOKKEEPING. Home, personal, business. \$2.25. Popular Mechanics, 200 E. Ontario St., Chicago.

BOOKS, PERIODICALS, PICTURES, POSTCARDS

SELECT Photographs, samples, complete list 25c. Albert McGoldrick, Mansfield, Mass.

"PUBLISH Magazine, \$1.00 capital"—10c. Bagley's Box 2522, Portland, Ore.

SEND 10c For trial subscription, American Freeman, Questions and Answers magazine, Haldeman-Jullus, Box 103, Girard, Kansas.

BACK Number magazines—Popular Mechanics, Fortune, National Geographic, Esquire, or most any magazine you want. Large stock. Send 5c stamp for price list. James G. Anderson, Broad and Stanton Sts., Trenton, N. J.

BOOKS Bought! Appraisal form free! Write! Bookery, Box 3941, Cleveland, O.

HEALTH & Physique Magazine for body culturists. Sample 15c. Box 583A, Reading, Penna.

N. Y. World's fair snapshots, 12 different \$1.00. Forman, 882 Lorimer, Brooklyn, N. Y.

STURDY Magazine binders for Popular Mechanics, 12 wire separators, 3" back, \$1 prepaid. Agents discount. Gold Shield Products, 350-M Greenwich St., New York.

BOOKS—Home study courses. Lowest prices. Catalog free. Raccliffe's, 1013 High, Petersburg, Virginia.

GAMES—ENTERTAINMENT

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AMAZING New liquid plastic opens up an entirely new and very profitable field to the home manufacturer. Make costume jewelry, chessmen, advertising novelties, etc. right in your own home. No experience or expensive equipment needed. Simply pour new liquid plastic in rubber, plaster or metal mold. It sets in about 20 minutes at low temperature, transforming into a beautiful solid plastic. Tough, resilient, non-inflammable. You can do a big production business. But, don't delay. Get started immediately. "Complete plastic kit, everything you need to get started, only \$1.00 postpaid!" Mail your order today! Stewart's Studio, Dept. P5, 2927 Wilcox, Chicago.

RECAST Old batteries into new. Latest achievements. Battery Laboratories, St. Paul, Minn.

LAWYERS Corporation laws mailed free. Charters, Arizona, \$46; Delaware, \$29; New York, \$48; plus tax fees. Lawyers Corporation Service, 154 Nassau, N. Y.

PROFITABLE Home business. Legitimate. No canvassing. Maywood Publishers, P-1107 Broadway, New York.

75 Year Old firm with distribution facilities metropolitan area wants to handle additional product or commodity. Might consider manufacturing or assembling. Box 53, Room 211, 146 Nassau St., New York.

1,642,222 CIRCULATION (Guaranteed) one inch advertisement \$15.40. Gets results. Diener-Dorskind, 1474 A Broadway, New York.

CASH Instead of promises! After years of experimenting, my plan "clicked"! No capital, canvassing, manufacturing, addressing, circularizing. Mainly homework. Steady income. Don't experiment, losing time, money. Complete operating instructions, 25c. Stamforde, 3762-B Broadway, New York.

SELL By mail! Inspiring, constructive literature. Jay, 6054-P Kenwood, Chicago.

THIS Book can make you independent. Price \$1.00. Marigold Sale, 7153 Devon St., Philadelphia, Penna.

20 PAGE Booklet mold making, plaster casting. X. L. rubber. Particulars free. Plastic Arts, 711 Neely, Muncie, Indiana.

BIG Money—Making raised wood letter and chromium plated signs. Complete instructions \$1.00. Foreign \$1.15. Photos, information ten cents. Modern Signs, Box 1109, Phoenix, Arizona.

BE Your own boss. Customers everywhere. Amazing profits. Read our ad page 142A. Rogers Manufacturing Company.

TREASURE Finders? Read Goldak advertisement on page 137A.

YOUR Own business! Selling by mail. Details free. Maples, 3418 South Marshfield, Chicago, Illinois.

BARGAIN Buyer's Guide to direct supply source. Lowest prices possible. \$1.00 postpaid. Hicks, Box 8, Brooklyn, N. Y.

START Own mailorder business! New magazine tells how. Sample copy 10c. Mallograph, AB-651 South State, Chicago.

CAPITAL—How and where obtained for personal and business needs. Capital Service, Arlington, Va.

MONEY Daily by mail. Plan and big mail 10c. Satisfaction guaranteed. Thomasson's, Minneapolis, Minn.

OPPORTUNITIES Aplenty! Money-makers that "click"! Latest offers free! Planagram, P-1079 Madison St., Brooklyn, N. Y.

15c WORTH OF materials moulds \$1.00 instant seller welcomed every Christian home. You cast own rubber moulds. Details free. Finart, 189-199 Van Rensselaer St., Buffalo, N. Y.

24 MONEYMAKING Formulas 25c. Logan Formula Bureau, 101 Market, Logansport, Ind.

HANDY. Salesmen America's fastest selling, new patented necessity. Longlife, 11 East 17th, New York City.

SUCCEED With your products. Make-sell. Formulas. Accurate analyses. Catalog free. B. Thaxly Company, Washington, D. C.

PLASTIC Art for profit. Stamp brings catalog. Colonial Art, Derry, N. H.

INVENTORS—We successfully sell inventions, patented and unpatented. Write for proof, and tell us what you have for sale. Chartered Institute of American Inventors, Dept. 4-C, Washington, D. C.

MONEY Making plans you won't regret. Satisfaction guaranteed. Hamilton, 1353 Hastings St., Chicago, Ill.

I WANT To send you proof of the wonderful pulling power of Popular Mechanics Magazine's classified pages. What's your proposition? Write me today. F. W. Johnson, Manager Classified Advertising, 200 E. Ontario St., Chicago, Ill.

BIG Money easily made in home or office. Business of your own; booklet describing 107 money making plans free. Chilton, Box 1105, Oakland, Calif.

"LEGITIMATE Home business." New! Profitable! Your labels. You control repeat orders! Amazing system! No canvassing! Samples, dime. Particulars free. Gardena System, 128PB, Station "S", Los Angeles.

AFTERNOONS Free for outdoors, shows, \$340 month home. Unique plans. No canvassing. Prepare for surprise. Folio-F, Station D, Los Angeles.

START Your own business. Make large profits. Sell new and used auction or bankrupt bargains in clothing and general merchandise. Experience unnecessary. Free wholesale catalog. Superior Jobbing, 1250-V Jefferson, Chicago.

COLOR Concrete with chemicals. Benches. Washing-wells. Spin concrete pottery. Stucco-rock. Miniature castles, mills. Cold glaze, marbling. Sample 10c. Hollywood CementCraft, 8527 Wonderland, Hollywood, California.

WHO'S Who and what's new in "The Mail Order World." Monthly—10c. Pines, 583-A Monroe, Brooklyn, N. Y.

EARN Extra money writing for publication. Simple method. Demand inexhaustible. Details free. Dona Veretts, 17 Groton, Lowell, Mass.

"MONEY By Mail" brings proven, tested money makers to start your own business. Sample copy 10c. Universal, Laccochee, Florida.

ARTIFICIAL Marble sanitary flooring, instruction covering wood or cement flooring 1/2 inch thick, fireproof, all colors, low cost, ornamental casting, concrete, plaster, papier-mache, garden furniture, statuary, flexible molds, particulars free. Chris Mahler, Elmont, N. Y.

DELAWARE Charters: Complete service \$35. Submitted forms. Chas. G. Guyer, Inc., Wilmington, Del.

107 WAYS To make money, in home or office, business of your own. Full particulars free. Elite Co., 214 Grand St., New York.

SELL By mail. Books, novelties. Bargains! Big profits! Particulars free. E. Elfco, 438 N. Wells, Chicago.

ELITE Collection of business plans, contains 107 tested plans and scores of formulas. Start own business; home, office. Particulars free. Elite Co., 214 Grand St., New York.

PLASTEX Industries offers industrious men an opportunity to start a business of their own, manufacturing art goods, novelties, souvenirs, etc., in Plastex and marble imitation. 5c material makes \$1 articles. Rubber moulds furnished for speed production. Small investment brings big returns. You are just in time for big wholesale season now starting. Write for interesting booklet mailed free. Plastex Industries, Dept. A, 1085 Washington Ave., New York.

CHARTERS: Delaware; best, cheapest; free forms. Colonial Charter Co., Wilmington, Del.

WHERE To buy at lowest wholesale prices. Information free. Yorena, Box P-312, Bayonne, N. J.

100 PROFITABLE Mail order and local plans. Gilbert Supply, 1107 Broadway, New York.

MAIL Order business is your opportunity. Many began small, now earn thousands yearly. No personal contact. Boundless opportunities. Have had over 30 years experience; will help you succeed. Send 25c for valuable booklets, none free. B. Breniser, 257 S. 21st, Philadelphia.

HOW And where to obtain capital fully explained, free particulars. Star Service, Wapakoneta, Ohio.

WE Help start you in business, furnishing outfits and instructions, operating "Specialty Candy Factory" home. Men and women, opportunity to earn \$20 to \$50 weekly, all or spare time. (Our 29th year.) Booklet free. W. Hillyer Ragsdale, Inc., Drawer 4, East Orange, N. J.

MAN In each town to plate auto parts, reflectors, bicycles, fixtures, mirrors, by late method. Simple plan of manufacturing at home starts you in good paying business. Free particulars and proofs. Gunmetal Co., Ave. H, Decatur, Ill.

MANUFACTURE From Phospholene. Cleaning fluid 1c gallon; bleach 2c gallon; hand soap 2c pound; and ten fast sellers. Sample 25c. Details free. Western, 6615 Denison Ave., Cleveland, O.

WANT More business? 2c daily, opens individual New York branch office requiring no room number on your stationery or advertisements. Co-operative Mail Service, 126 Lexington Avenue, New York.

FINANCIAL Independence obtainable by placing coin operated merchandise vending machines, out on percentage basis, no experience required. Little capital needed. Write for free details. Torr, 2047½ South 68th Street, Philadelphia, Pennsylvania.

DELAWARE Charters—Sell shares. Raise capital. Low cost. Free details. Corporation Fiscal Co., Wilmington, Del.

1059 WAYS To start a profitable business. Get Popular Mechanics book of modern formulas and methods for practical specialty manufacturing. Price only \$1.25 postpaid. Popular Mechanics Press, Room (C38), 200 E. Ontario St., Chicago.

MONEYMAKING OPPORTUNITIES

YOUR Own local or mail order business. Economical 7 purpose lotion, perfumes, etc., can now be made at home, no equipment necessary. We show you how with instructions, sales promotion plans. Complete start, sample, system for dollar, or send quarter for plans, instructions, without sample. Mailadvertising Associates, Greene, New York.

GET Cash for used stamps. Sell them for 75c and \$1.50 per pound. Any kind of used stamps, even common 1c, 1½c, 2c, 3c and stamps off parcel post packages. Unpicked and unsorted. Above information included without additional cost to all who send 25c for The B-F-A Budget of money making information. John A. Stager, 1391 E. 30th St., Cleveland, Ohio.

BIG Interesting moneymaking opportunity magazine. Homework, mail, local. 3 months 25c. Publisher, 2620 Stromberg, Pittsburgh, Penna.

YOU'LL Like resilvering mirrors, auto parts, reflectors, making chipped glass signs. Write. Sprinkle, Plater, 287, Marion, Indiana.

3 MONTHLY Mail order magazines, filled with money making opportunities, 10c. George Penner, 1618 Lucia, Louisville, Ky.

SELL Cosmetics by mail. Sample powder, full particulars 10c. Cosmetics, Box 104, Wilkes-Barre, Penna.

MILLIONS Jobless! Supply satisfying employment information by mail. Keep dollars received! We fill your orders. Co-Operative Service, 77 Swan, Buffalo, New York.

INVESTIGATE This. Quick flashy demonstrator. Absolutely new. Big profits. Unlimited prospects. Moore, 1651 Jerome Ave., S. W., Grand Rapids, Mich.

MILLION Articles. Buy wholesale. Valuable directory. Dime. Ideal Service, D-5, Park Ridge, Ill.

BIG Profits day and night without selling. Operate Silver Kings. Details free. Automat, 3427 Fullerton, Chicago.

"THINK And Grow Rich"! Astounding book explains thirteen necessary steps. Stamp brings details. Novex, 1210n 11th Terrace, Birmingham, Ala.

WIN \$1.00 Check answering three questions. Schemer prints schemes, tips, opportunities, formulas, established 1899. How old? Yearly price? Copies yearly? With answer send 25c (half price) for six copies. Schemer Monthly, Alliance, Ohio.

"WIN Profits!" Mailorder business at home. "Spare time." Particulars, moneymaking magazine. Postal, Raymond Schwartz, South Amara, Iowa.

GRAIN Traders. Send for our dependable forecasts or system. Sample 10 cents. Mark-O-Graph, 210 W. 8th, Kansas City, Mo.

MAILORDER Opportunities, plans, formulas, information. Circulars free. Harvey Teeple, Decatur, Indiana.

JOBLESS? Get a job you'll like, work easy; keep dollars coming. Details dime; money making opportunities. Cap Waller, Black River Falls, Wisconsin.

LATEST Propositions. Name on mailing list for stamp. Advertisers' Assistants, Box 445, West Liberty, Kentucky.

OPPORTUNITY. Collection 100 tested moneymakers \$1.00. Sample 25c. Rabiro, 210 5th Ave., New York.

MONEY In butterflies, moths. See Sinclair Display Advertisement on page 14A.

CARPENTERS: Sell, install overhead garage door hardware. Paying business. Circular free. Wilkie, Independence, Mo.

MAKE—Sell your own goods. Details free. Pederson, 1609½ East 5th, Duluth, Minn.

PERFECTED Window cleaner! 128 gallons concentrated \$9. Sample 25c. Kemiklean, 1906 Rosemont, E. Cleveland, Ohio.

SPLENDID Opportunity collecting reptiles, frogs, toads, for us. Our instructions make collecting easy. Contract and particulars dime. Biological Research Laboratories, Dept. M-11, Springfield, Missouri.

EXCELLENT Moneymaking book loaned 30 days for quarter. "What I Would Do" folio complimentary. Anderson Lending Library, Box 548, Muskogee, Okla.

SPARE-TIME Business plans. Marvin Studios, 203 So. Dearborn, Chicago.

JUST Out! \$100's await you. 10,000 formulas—1000's recipes. Big 883 page book. \$2 prepaid. Adams-Brown, Chestnut Hill, Mass.

GANDY. Ten selected professional formulas. Fast sellers. \$1. A. Poirier, Dutton, Mont.

RAISE Earthworms for profit. Information free, stamp appreciated. Bureau Zoological Research, 106A Broadway, Peoria, Ill.

MAN In each town to plate auto parts, reflectors, bicycles, fixtures, mirrors, by late method. Simple plan of manufacturing at home starts you in good paying business. Free particulars and proofs. Gunmetal Co., Ave. N, Decatur, Ill.

DOLLARS By mail with "Dollarmor" choice opportunities. Sample dime. Lawndale Press, Franklin, N. H.

STOP Squealing—Start crowing! Work mornings home—country drives or movies afternoons! No canvassing! Folio-A, Station "D," Los Angeles.

HELPERS Wanted! Big money introducing advertising necessity. Capital, experience unnecessary. Details stamp. Hurry! Johnston, P-257 North Washington, Timb, Ohio.

DOLLARS In Fixit service. Particulars. Houlgate, Station C, Pasadena, California.

12 RED Hot, slickest, legitimate ways to make money quick. This is rare information. Write Dixon, Box 1403, Youngstown, Ohio.

\$25.00 STAMPING Names per 100 key-checks. Sample 25c. Details furnished. Bohn Company, Box 86P, Wilkes Barre, Penna.

MOULDS. Guaranteed, for casting toy soldiers, Indians, trappers, warships, sinker moulds, 244 kinds. Send 5c for illustrated catalogue. Henry C. Schiereke, 645 Spencer, Ghent, N. Y.

BIG Money easily made; 107 test plans for your choice. Home, office. Descriptive booklet free. Elite Co., 214 Grand St., New York.

YOUR Name—5,000 mailing lists—25c. Get samples, opportunities galore from all over world. Pines, 583-A Monroe, Brooklyn, N. Y.

WHOLESALE Sources. 500,000 articles. Free directory. Maywoode, 1107 Broadway, New York.

ADVERTISING Coupon book deal that clicks. Details, samples \$1.00. Dale Wolfe, Randall, Ia.

START New, profitable business, in home, making sensational, quick-selling printed raised-letter stationery, without press, type, or printing experience. New simple process. Get sample sheet, starting instructions quickly. Profits big. Write Home Embossers, 1071 Niagara, Buffalo, New York.

IDEAS Guaranteed to make you money. Krueger, 5751 Justine, Chicago.

HOME-WORKER'S Prosperal Guide, 64 page magazine, 10c. Sanvoy, Arlington, Kentucky.

1,000,000 ARTICLES Wholesale. Free samples. Directory 10c. Jelsmith, Waltham, Mass.

AMAZING Mailorder plan. Marvelous possibilities. Just send stamp. Box 116, Bluford, Ill.

MILLIONS Made prospecting Ontario's rich gold fields. Ontario's 1937 gold production was \$90,522,454.00; California's was \$40,932,200.00. Combine healthy outdoor vacationing with opportunity of great wealth. Map showing gold prospecting areas and comprehensive information in plain talk \$1.00. Old Prospector, Box 623, Kirkland Lake, Ontario.

MONEY. Money, we can put you next to the best money-getter of them all. Send \$1.00 today. You will never regret it. American Laboratories, P.O. Box 87, Clinton, Mass.

25c COIN Brings telescopic charm and money making opportunities. Michon, 616 South Park, Buffalo, N. Y.

TREASURE Finders? Read Goldak advertisement on page 137A.

\$50 A WEEK With a kodak. Booklet describing 100 magazine markets 25c. Modern Distributing Agency, Box 51, Hedley, B. C., Canada.

EARN Money in your spare time taking subscriptions to Popular Mechanics. Unlimited possibilities, every family a prospect. Easy to sell. Bonus paid in addition to liberal commission. Send postcard for further details today. Circulation Dept., Popular Mechanics Magazine, 200 E. Ontario St., Chicago.

FORMULAS, PLANS, ETC.

SELF Vulcanizing cement—Typed formula. Formula Agency, 490 Western Ave., Lynn, Mass.

MORE Money! Make and sell reliable products. 25 formulas \$1.00. Voelker Sales Trucks, Reed City, Mich.

MONEYMAKING Formulas! 50c brings 100. Schroeder, 803 Wisconsin, Peoria, Illinois.

WATERLESS Soap guaranteed. Clean dirtiest hands in America. Formula \$1. Jerome Jones, Hollins, Alabama.

FORMULAS—All kinds. Real moneymakers. Lowest prices. Catalog free. Clover Formula, P-5, Niles Center, Ill.

MOTOR Oil 2c gallon. Reclaim used oil. Formula 25c coin. George, 285 Queen, Germantown, Philadelphia, Penna.

GUARANTEED Formulas—New fast sellers. None better. Lowest prices. Catalog free. Kemico, 49M, Park Ridge, Ill.

SPECIAL! Eleven selected formulas, \$1.00. Soilless agriculture. Kleervision cloth, iron cement, plastic wood, mechanic's soap, illuminous paint, antifreeze, motor reconditioning compound, cracked block sealer, rebuild batteries, meat tenderizer. Dunco, Middletown, Ohio.

ANALYSIS. Research. Newest guaranteed formulas. Biggest catalog free. Nominal prices. Gibson Laboratory, Chemists, BD-1142 Sunnyside, Chicago.

CHEMICAL Garden formula 65c in stamps. R. Edmondson, 441 E. Main St., Rochester, N. Y.

REFINE Used oil without cost. Particulars. F. Gerwin, Fairview, Oklahoma.

25 MONEYSAVING Formulas 25c. Cosmetics, waterproofing, cleaners, refinishing firearms, polishes, etc. Lawrence, 11126 Raymond, Los Angeles, California.

WOOD Finishing, without paints, stains, etc. Formula, quarter. Shervin, Box 116, Breathedsville, Maryland.

WHY Gamble with "cheap" formulas? Here's manufacturers' certified-tested, formulas. Reasonable—responsible service, producing for you, bankable results! Making today's newest, successful products! All lines! Miller, Chemist, 1706PM, Tampa, Florida.

MONEYMAKERS—Iceless ice. Oil reclaiming process. Rubber mold making. Waterless hand soap. Soilless agriculture. 25c each. Ideal Service, 179X, Park Ridge, Ill.

THAXLY Formulas for perfect products. Accurate analyses. Catalog free. B. Thaxly Company, Washington, D. C.

FORMULAS. Latest money makers. Literature free. Belfort, 4042 N. Keeler, Chicago.

FORMULAS: 15 Proven moneymaking formulas \$1.00. (Not stock-formula catalogue stuff), real unusual offers. List free. Marvel Laboratories, 6629 No. Maplewood, Chicago.

ELITE Formulas and plans; make and sell your own products. Descriptive booklet free. Elite Co., 214 Grand St., New York.

CHEMISTRY

FREE Chemistry catalog. Supplies at 50¢! Equip complete laboratory. Send 3c for postage. Kemkit Scientific Corp., 397P Bridge St., Brooklyn, N. Y.

HANDBOOK Of experiments for amateur chemists, illustrated, postpaid 50c. Experiment booklet 15c. Chemistry catalog 5c. Reading Scientific Company, Reading, Penna.

FREE: 40 Page catalog of chemical and laboratory supplies for amateur chemists. Wollensak microscopes and supplies, scientific books at big discount. JE-5 Winn, 124 West 23 Street, N. Y. O.

CHEMICALS in 5c quantities. Catalog 5c. Fleischer's Laboratories, Everett, Mass.

CHEMICALS, Laboratory, glassware, apparatus. Send 3c for catalog CPI. Biological Supply Company, 1176 Mt. Hope Avenue, Rochester, N. Y.

HELP WANTED

MEN! Earn \$5 daily extra. Retain your position. Sell beautiful etched metal social security plate and double cellophane leather case. 70% commission. Send your S. S. number and 10c for agent's equipment. Wm. Hamant, 665 W. Lexington St., Baltimore, Maryland.

M. M. Earned \$267, three weeks, raising mushrooms in cellar! Exceptional, but your cellar, shed perhaps suitable. We buy crops. Book free. United, 3848 Lincoln Ave., Dept. 68, Chicago.

IF You are ambitious you can make good money with a Rawleigh route. We help you get started. Sales way up this year. No experience needed. Steady work for right man. Write Rawleigh's Box E-2-PPM, Freeport, Ill.

EARN \$5 Daily extra. Retain your position. Sell etched metal social security plate and double cellophane leather case. C. Bunn, 665 W. Lex. St., Baltimore, Md.

MEN Wanted for coffee routes. Earnings up to \$42.50 first week. Brand-new Ford sedan given you as bonus. I send everything; you don't risk a penny. Details free. Mills, 6039 Monmouth, Cincinnati, Ohio.

AMAZING Magic crystals make powerful all purpose cleaner. Take orders everywhere. Pays up to 200% profit. Sample free. Write Emsee, Dept. 104, Monroe, Michigan.

STEADY Work—Good pay. Reliable man wanted to call on farmers. No experience or capital required. Pleasant work. Home every night. Make up to \$12 a day. Wonderful new proposition. Particulars free. Write McNeess Co., Dept. 272, Freeport, Illinois.

AGENTS WANTED

REBUILT Vacuum cleaners. General Elec., Hoover, Eureka, Electrolux and other makes, look and work like new. Low prices, large profits. Economical Distributors, Box 224, Albany, N. Y.

MOTH Tablets. Headquarters moth tablets, crystals, wafers, deodorants, etc. Write for lowest prices. Best quality. Distributors, agents wanted. Dept. P. Smico Products, 1123 Draper St., Cincinnati, O.

AGENTS Make big profits on food products, bargain deals. Low wholesale prices. Rush name for trial outfit offer. Ho-Ro-Co, 2810-S Dodier, St. Louis, Mo.

500% PROFIT With new perfected (1939) quick-action, no flint, automatic gas lighter. Retail 25c. Sample 5c. New Method Co., Box PMG-77, Bradford, Penna.

COUNTY Distributors, truck jobbers, agents in cosmetics, flavoring extracts, household and medicinal specialties; quality products; unusual proposition; investigate. Sweet Manufacturing, Wabash Station, Pittsburgh.

JUST Out! Amazing fast selling 25c household necessity. Saves up to hundreds of dollars. Sell 3 to 4 each home. Make up to \$6.00 daily. Free sample. Puro, 3107 Pine, Dept. E-299, St. Louis, Mo.

DON'T Be a job hunter—Start your own business on our capital. No hard times; no lay-offs; always your own boss. Hundreds average \$3,000 to \$5,000 annual sales year after year. Sales way up this year. We supply stocks, equipment on credit. 300 home necessities. Selling experience unnecessary. Wonderful opportunity to own pleasant, dignified, profitable business backed by world-wide industry. Write Rawleigh's, Dept. E-U-PPM, Freeport, Ill.

LARGE Profits selling Magic Fluid. Repairs instantly any fabric or rubber, heat and laundry proof. Eureka, 1911 S. Wabash, Chicago.

MYSTERIOUS Disc heats water instantly without coal, gas or oil. Pays up to 233% profit. New principle. No risk sample offer. Write Lux Co., Dept. H-2, Elkhart, Indiana.

BEAUTIFUL Bird pictures handmade with genuine feathers. Sell on sight! Large profits! Free particulars. Samples 10c stamps. Marquez-PH, Apartado 1176, Mexico City.

SWANK New lipstick. The talk of New York. Fast seller. Tremendous repeats. 100% profit. Sample free. Charlie, Jamaica, N. Y.

BUSINESS Proposition resilvering mirrors, autotaps, reflectors, making chipped glass signs. Write, Sprinkle, Plater, 128, Marion, Indiana.

BARGAINS—100 Blades 25c; electric razor 75c; candid type camera 90c; soap, gross cakes \$1.44; blankets each \$1.20. Free catalog. World's lowest priced wholesalers. Mills Sales, 901 Broadway, New York.

WEAR Fine hose I send without cost with outfit while taking orders for amazing new hosiery. Replacement guaranteed against holes, snags, and runs. Rush name and hose size. Wilknit, Desk E-37, Greenfield, Ohio.

QUICK Easy selling products. Large profits. Big demand. E. Corcoran, Box 2553, St. John's Station, Portland, Ore.

FASTEST Selling amusement novelty. Dancing Sambo, tap dancing dummy. Samoles 50c. Seslen's, 5730 Kingsbury, St. Louis, Mo.

BUILD Your own paying business. Particulars free. Sidney, Pottsville, Penna.

SELL—"Perfumed personal stationery"—embossed. Ricenzi Press, 31½ Sixth Ave., Newark, N. J.

AGENTS Earn up to \$45 in a week with nationally known, fast selling food products and everyday necessities. Marvelous sales, bargain and premium deals. Particulars and trial offer mailed free. Zanol, 6045 Monmouth, Cincinnati, Ohio.

NECESSITIES Always in demand! Experience unnecessary to earn steady income selling shirts and sportswear factory to wearer. Gigantic variety; one year guarantee; customized fit (90 sizes). Half price offer creates amazing values. World's largest concern of its kind. Our sales force earns \$100,000.00 yearly. Get your share! Simply write orders. We deliver and collect. Postcard brings you complete money-making outfit free. Write Dept. 236, Rosecliff-Quaker, 1233 Broadway, New York.

QUICK Seller and repeater. Write Geiger, 6538 North Maplewood, Chicago.

WORLD'S Biggest seller. Write for particulars. Girard Company, Washingtonville, Ohio.

MONEY In butterflies, moths. See Sinclair Display Advertisement on page 14A.

AGENT, Manufacture specialties. Hire agents yourself. Particulars free. Tilford, Box 516, Louisville, Ky.

DISTRIBUTORS Sell nationally known ant. roach, fly, bed bug killers, each \$15 daily. Every home, hotel, food store needs, full particulars and sample 25c. Lucas, 174 West 65th St., New York.

SELL Social security plates. Over 40 million buyers. 500% profit. Full or part time. New plan. Employ others. No money needed. Don't wait. Act now. Free outfit. Federal Name Plate Co., 287 Broadway, New York City, Dept. PM-5.

CHINESE Checkers. Fastest selling game of the year. Factory connection. \$1.00 brings samples and prices. Anthony Novelty Co., Lamoni, Iowa.

AMAZING Zipper clothesline. Instant demonstration. Sells on sight. Dunn Mfg., Hempstead, N. Y.

NEW Attractive 25c store signs, changeables, price sets. Big profit. Marvin, 504 McDonald Ave., Brooklyn, N. Y.

MEXICAN Art goods, 4x7 beautiful sample. Details, quarter. Deluxe Creations, Laredo, Texas.

SELL By mail: New magazine tells how. Sample copy 10c. Mallograph, AG-651 South State, Chicago.

COSTS 6c; Sells 35c. Household necessity. Carry day's supply in pocket. Sample 10c. Mero, Box 344, Punxsutawney, Penna.

MILLIONS Of prospects! Buyers everywhere! Sensational social security plates with name gold-stamped on leatherette case! Fast seller! Big profits! Complete selling outfit free! Union Specialty, 1777-B Broadway, New York.

AGENTS—Quick selling combination. Big profits, repeats. Samples, details free. Universal, Orange, Massachusetts.

\$100 WEEK, \$3.95 Automatic fire extinguisher. Sells dealers, homes, factories, motorists. Biggest profit! Exclusive! Firefox, Madison, Wis.

AGENTS—To mail our literature. Good profits. Home business. Maywood, 1105-1107 Broadway, New York.

90c COMM. On \$1 repeat sale. Become mfg's. exclusive distributor for new general cleaning method. Homes and businesses buy on sight. Kleenmaster Corp., 220 Odd Fellows Bldg., South Bend, Ind.

500% PROFIT. Gold and silver colored sign letters. Offices—stores. Large sizes, 1c. Free samples. Modernistic, B-3900 Lincoln Ave., Chicago.

NO-RISK Famous Favor plan. Amazing profits. Super Products, 1259 West Main, Decatur, Illinois.

AGENTS—Fast selling American boomers, 50c each; \$2.50 dozen; \$15.00 hundred. Postpaid. Sall-Bak Factory, 1510 S. Noland, Independence, Mo.

MONUMENTAL Salesmen, agents, wanted. Lowest manufacturers prices. Mikulich Company, St. Cloud, Minn.

COSTS 3c; Sells 50c. Household necessity made at home. Send 10c for dollars worth with labels. Home Occupations, St. Paul, Minn.

BIG Money taking orders; shirts, ties, hosiery, underwear, pants, uniforms, dresses, etc. Sales equipment free! Experience unnecessary. Write Nimrod, 4922-AN Lincoln, Chicago.

EX-O-LENE! Brand new! Power and mile increaser! Millions interested. Protected territory! Big profits! Be first. Information free. Thermo Exolene Works, Peoria, Ill.

SUCCEED With your products. Make-sell. Formulas. Accurate analyses. Catalog free. B. Thaxly Company, Washington, D. C.

SELL Lucky Brown Hair Dressing to colored folks. \$5 day possible. Famous Co., 2243-YJ Indiana Avenue, Chicago, Illinois.

ATLAS Window sign letters. Large sizes—penny each. Get beautiful samples. Atlas, 7941 Halsted, Chicago.

ENGRAVED Name plates, numbers, signs, etc., easily sold, profits large. Brett Bros., Winthrop, Mass.

300% PROFIT Selling gold leaf letters for store windows; high grade letters 1½c each. Free samples. Metallic Co., 438-B North Clark, Chicago.

SALESMEN Work in new way, demonstrating to man or woman "Look-well Kit" (not toilet preparation). Work homes; offices; stores. All or part time. Sells \$1.25 most all profit. Gladly send details. Be quick. Le Cliff Distributing Co., Gold Street, Cedar Lake, Ind.

500% PROFIT! Gold and colored sign letters for windows, offices, trucks, signs. Auto monograms. Easily applied by agent or customer. Neonite, Akron, Ohio.

SELL Social security plates. Sample 10c. Particulars free. Reliable Sales Co., 6 West 28th Street, New York City.

200% PROFIT. No investment, fast seller, field unlimited. Danna, Box 57, West New York, New Jersey.

BIG Money applying initials on automobiles. Easiest thing today. Free samples. Also, sideline salesmen for short order decalcomania name plates. "Ralco," 1305 Washington, Boston, Mass.

ELGIN, Waltham, Hamilton watches. Make big money. \$3.95. Send for free jewelry catalog. Plymouth Jewelry Exchange, 163-B Canal St., New York.

AGENTS: Smash go prices! Santos coffee 12c lb. 4-oz. vanilla 8½c. Razor blades 10 for 8½c. 100 sticks chewing gum 12c. 150 other bargains. Premiums. Experience unnecessary. Carnation Company, P.O. St. Louis, Mo.

AGENTS—Opportunity make money; book containing 107 successful business plans; home-office; send for free introductory booklet. Elite Co., 214 Grand St., New York.

SELL Fast repeating cleaner everywhere. Sample free. Cary Company, Joliet, Ill.

STARTLING Invention—Pocket adding machine. Nationally advertised \$2.50. Whirlwind seller. Big profits. Baby Calculator Co., Box 1118, Chicago.

REVOLUTIONARY Window cleaning tool. Good Housekeeping approval. Only ten \$2.25 sales daily to housewives, factories, schools, stores will make you \$350.00 monthly. Carter Products Corp., 960 Front Ave., Cleveland, Ohio.

BIG Money applying initials on automobiles. Write for particulars and free samples. American Letter Company, Dept. 40, Dunellen, New Jersey.

FREE Sample—Amazing cleaner; sells homes, taverns, everywhere. Big profit—fast repeater. Betco, 5007 Irving Park, Chicago.

MANUFACTURE Specialties, hire agents yourself. Big money. Free literature. Gilbert Supply, 1107-P Broadway, New York.

AGENTS: Stamping names on pocket-key protectors. Sample check with your name, address, 25c. Stamping outfits. Emblem checks, check-fobs, name plates. Hart Mfg. Co., 303 Degraw St., Brooklyn, N. Y.

MAKE Big money selling paint and liquid roofing direct from factory. Easy terms and no down payment. Work either full or part time. Write today for free sample case. Electric Paint and Varnish Co., Dept. C, Cleveland, Ohio.

YOUR Own business, dignified. No selling. A few weeks of your time insures you steady income for years. We do the work. Small investment. Printograph Co., 563 Warren St., Roxbury, Mass.

DO You want agents for your proposition? Your ad in this space will place your message before hundreds of men seeking fast-selling products. My folder "How to Secure Agents" is filled with proof. I'll gladly send you a copy free. F. W. Johnson, Manager Classified Advertising, Popular Mechanics Magazine, 200 E. Ontario St., Chicago.

HIGH-GRADE SALESMEN

FREE. New style printing catalog makes selling easy. Pays big profits. No experience necessary. Fits in with any line. High quality printing on Arrow or Hammermill bond paper at attractively low prices. Arrow Service makes satisfied customers and repeat orders. Amazing values for your customers on letterheads, billheads, statements, envelopes, cards, labels, sales books, tags, guest checks, etc. Union label if desired. Every business uses printed stationery. Write giving home address, state present occupation and name two references. Arrow Press, Inc., 664 Produce Exchange Bldg., Minneapolis, Minn.

LARGE Paint and roofing manufacturer wants reliable men to sell direct to factories, stores, warehouses, schools, homes, and farmers, at factory prices on credit. Big demand. Good profits. District manager's position open for right man. Reply: The Madison Paint Co., Dept. C-913, Cleveland, Ohio.

SELL Business cards \$1.50 thousand. Business stationery, book matches, advertising gummed tape, advertising pencils, salesbooks, rubber stamps, pricing sets, adv. specialties, 35% commission. Money making specials. Free sales portfolio. David Lionel Press, 312 So. Hamilton, Dept. FP, Chicago.

DID You make \$50 last week? Does your job offer you real future? If not, why not start a wholesale business of your own? Start with little as \$2.50. Handle line 200 nationally advertised 5c-10c products. Show merchants new plan for increasing sales and profits. Handle everything from your home at start. Chance to operate one of our Silver Fleet service trucks. Facts free. World's Products Co., Dept. 10-E, Spencer, Ind.

MAKE More money with Red Comet Automatic Fire Extinguishers. Low price. Proved seven years. Splendid sales outfit free. Some good territory open. Exclusive. Write quick. 704 Red Comet Building, Littleton, Colorado.

MAN Wanted to supply Rawleigh's household products to consumers. We train and help you. Good profits for hustlers. No experience necessary. Pleasant, profitable, dignified work. Sales way up this year. Write today. Rawleigh's, Dept. E-53-PPM, Freeport, Ill.

SELL Stores lace handkerchief sensation. 100% profit. Sample 10c. Klittrells, Ackley, Iowa.

SALESMEN. Distributors — Established company. New automotive system all car and fleet owners vitally need. Sells for \$2.95. Lloyds of London insurance up to \$5,000. Makes quick convincing demonstration. Large repeat business. New proven merchandising plan to dealers carries 100% insurance protection for you. Profits up to \$600 per month. Exclusive territories. Guaranteed sales or money back under Plan A. Write today for details of full-size test sample and all facts. No obligation. Craver-Jay Corporation, Dept. 110, Kansas City, Missouri.

ADVERTISING Book matches—Sell union label book matches. Fastest selling line in America. Large sales producing kit, sample matches, complete cut catalog, eight color combinations make selling easy. Commission in advance. Superior Match Co., 7530 Greenwood, Dept. M-5, Chicago.

SOCIAL Security plate salesmen: Engrave or stamp your own plates. Keep all the profit. Electrograver Company, 653 South State, Chicago.

SALESMEN — Distributors 200 items, brushes, mops. Marvelous magnetic brush, exchels vacuum cleaner. Big profits. Newway Brush Co., Hartford, Conn.

BIG Commissions selling to stores celluloid pricing tickets, metal shelf moulding. To restaurants, menu covers, signs. P. Pricing Press, 124 White St., New York.

AMAZING Seller. All weather coat guaranteed ten years, \$9.95. Commission \$3.00. Selling outfit free. Tenyear Raincoat Co., Dept. 30, Templeton, Mass.

COCKROACHES Killed new way. Food form in permanent container. Big profit. Repeat sales. Free starting offer and sample carton 25c. Gilles Products Company, 513-D South Tenth, Fargo, N. D.

NEW Framed feather pictures! Retail 69c; sample 20c stamps. Dozen \$1.80 postpaid. Marquez-PHA, Apartado 1176, Mexico City.

GLOVES—Sell wholesale, retail. Wickizer Glove Co., 564 Hooper Rd., Johnson City, New York.

MAGIC Hygroscope indicates room humidity. Sells to advertisers. 25 cent coin brings 8 samples, proposition. Bach Company, 4709 Avalon, Los Angeles.

FAST Selling line automotive equipment, accessories. Bought by jobbers, oil companies, fleet owners for years from established manufacturer. Exceptional opportunity. Equipment Manufacturing Co., St. Joseph, Mo.

NOVELTY Salesmen: Big money main or sideline. Dollar for sample and proposition. Refunded on third order. Hill Specialties, 9804 Avenue "J," Chicago, Illinois.

SALESMEN. Making \$20 to \$50 daily demonstrating new Airo Plane type fans to stores, restaurants, taverns, etc. Also drive way signals to gasoline stations. Write. Universal Fan Co., Peru, Indiana.

FREE Saleskit latest 1939 fast selling products. Variety. Lima, Ohio.

BOOK. Magazine, specialty salesmen. The book that sells itself. No sales effort. Creative Crafts, Box 133, South Chicago, Illinois.

OLDEST Guaranteed gasoline station signal. Air-Matic Signal Co., Delphos, Ohio.

SALESMEN Sell calendars, book matches, fans, advertising novelties. Samples free. Fleming Calendar Co., 6543 Cottage Grove Ave., Chicago.

COUNTER Card salesmen: Sensational new 10c sellers for all stores. Nothing else like it. Write Manufacturer, 653 South State, Chicago.

BIG Money taking orders: shirts, ties, hosiery, underwear, pants, uniforms, dresses, etc. Sales equipment free! Experience unnecessary. Write Nimrod, 4922-BG Lincoln, Chicago.

ADVERTISING Book matches offer big daily cash earnings! Full or part time. Experience unnecessary. Top quality at new low prices. Big 1939 line. Free baseball schedule offer. Fast repeats. Factory direct. Free outfit. Match Corp. of America, 3433 West 48th Place, Dept. E-6, Chicago.

OPENINGS! Call on all dealers with new trade-stimulator plans. It's "hot." \$3 commission on each \$5 sale. Big repeat commissions. No investment. Sales kit free. Regal, 6227 Broadway, Dept. C55, Chicago.

SPARKLING Glo-Brite signs sell fast to stores, restaurants, taverns. Lasting gold finish. Religious mottoes. J. A. Baxter, Cambridge, Ohio.

NEW Specialty—Sells every business and professional man. Four \$15 sales daily pay \$280 weekly. Farrell cleared over \$1,000.00 monthly. Write, F. E. Armstrong, President, Dept. PM, Mobile, Ala.

BLADES. Finest quality. Factory prices, postpaid. Ace Blades, Buffalo, N. Y.

EXCELLENT Opportunity selling our complete line of brushes, largest commissions. Write for sales plan. Wire Grip Sanitary Brush Company, 2300 5th Ave., New York.

BIG Money making opportunity for right man. Take over exclusive territory brand new specialty for lunch rooms, taverns, drug stores. Quick demonstration. \$5.00 profit every \$10.00 sale. Write today your territory may be open. Ellwood, 709 So. Cicero, Chicago.

AMERICA'S Biggest brush bargains. Bigger and better than ever. Catalogue. Frank-Lin Brushes, Bridgeport, Conn.

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LEARN To be a master mechanical optician. Many earn \$25.00 to \$60.00 weekly. Select a field that is not overcrowded. Write American Institute of Mechanical Optics, Box 427, Mount Vernon, Illinois.

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WATCH Repairing is steady profitable work. Experts always in demand. You can learn watchmaking trade at home, spare time. New original instruction system. Script engraving course included. Write for free details today! Nelson Co., E-2001 Manhattan Building, Chicago.

FOR An extremely profitable lifetime business, operate a collection-credit agency. Free folder. Cole Associates, Syracuse, N. Y.

WOULD Work in foreign countries interest you? Can furnish list of 100 firms operating in foreign field. Details free. Lakeside Service, Box 36, South Chicago, Ill.

U. S. Government Jobs. Commence \$105-\$175 month. Prepare at home, for next examinations. Experience usually unnecessary. Full particulars—list positions, free. Write today. Franklin Institute, Dept. K3, Rochester, N. Y.

DOUBLE Entry bookkeeping mastered 60 hours with keys; guaranteed. (Diplomas.) International Bookkeeping Institute, 8 Springfield, Mo.

LEARN Touch typing, 35 cents coin. Palmo System, Box 413, West Palm Beach, Fla.

INVENTIVE Minded can become independent. Explanation free! O-Higbee, Cantil, Calif.

LEARN Tool and die designing. Evenings. Write. Belton Tooldesigning Course, 2935 No. Harding, Chicago.

LEARN Soap making at home. Stamp. Posera, B-4545 Bartlett, Milwaukee.

AIR Conditioning course, new book form. 160 pages 8½"x11". Interesting, instructive. Reduced price \$2.00. E. Moore, 805 Eckman, South Bend, Indiana.

DRAFTSMEN in great demand now. Big pay. Learn at home. Information free. Write Monroe Institute, Alton, Illinois, immediately.

FREE Information. All civil service examinations. Write today. Pergande, Publishers, Milwaukee, Wis.

NEW Phonetic chart, 24x36, teaching English, 25c. Simmons, Rocky Hill, Conn.

BIGGEST Paying trades. More steady work. Decorating, paperhanging, graining, marbling, sign painting, pictorial painting. Residential and home study courses. Catalog free. Chicago Painting School, 437 North Clark Street, Chicago, Illinois.

VENTRILLOQUISM — Complete course \$1.00. Tauriello, 45 Scholes St., Brooklyn, N. Y.

GOVERNMENT Jobs available. Opportunities best now. Write Rand Service, 216A Colorado Bldg., Washington, D. C.

SHORTHAND—Learn quickly, easily, in spare time. Complete system, postpaid, \$1.00. Stedi-Stroke System, Hearst Tower, Baltimore, Md.

BECOME Practical scientific investigator. Modern, illustrated course. Thorough training by former agent U. S. secret service. Particulars free. International Secret Service Institute, PM-59, Hoboken, N. J.

SLIDE Rule simplified by Richardson, 4212 - 24 Place, Chicago. Hundred pages, hundred illustrations. Dollar.

MONEY In cartooning! See Raye Burns School advertisement on page 137A.

MASSAGE, Hydrotherapy, dietetics, drugless therapeutics, chiropody, taught by mail. Evans Correspondence School, Montgomery, Ala.

LEARN To be a master mechanical optician. Master mechanical opticians earn \$25 to \$50 per week. Select a field that is not overcrowded. Big demand for skilled mechanics. Write for particulars. American Institute of Mechanical Optics, Box 427, Mount Vernon, Illinois.

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LEARN Auto mechanics, body, repairing, welding electricity, refrigeration, Diesel. Stevinson's, 2008A Main, Kansas City, Mo.

GOV'T Jobs start \$1200-\$2100 year. Men-women age 18-50. Former examiner's tested method helps qualify you. Particulars, list jobs free. Write today. Patterson School, 8C Mercantile Bldg., Rochester, N. Y.

TELEGRAPHY Taught thoroughly. Railroad retirement act creating opportunities for new operators. Expenses low. Catalog free. Dodge's Institute, Hiatt Ave., Valparaiso, Ind.

SECRET Investigation. Experience unnecessary. Detective particulars free. George Wagner, M-2640 Broadway, N. Y.

PLAYS, STORIES, MANUSCRIPTS

STORIES, Articles, books criticized, marketed. Collaboration on percentage. Poetry department in charge former editor Poetry World, New York Publishing Service, Literary Agents, 246 Fifth Avenue, New York City.

WANTED: Radio scripts and ideas. Details free. Script Exchange, Studio 6, 3819 Wilshire, Los Angeles.

ORIGINAL Poems, songs wanted for publication, radio. Westmore Music Corporation, Dept. 33G, Portland, Ore.

CARTOONING, COMMERCIAL ART, SHOWCARD WRITING, SIGN PAINTING

HAVE Your own money making business. Learn show card writing, sign painting. Write for details. Begley Specialty, 1472P Broadway, New York.

ANYONE Can paint signs with Speedway Letter Patterns. Send nickel for samples, information, instructions. Display Letters Co., 8309 Third Ave., Brooklyn, N. Y.

LETTERING Artists! \$1.00 buys our famous ten-lesson course in advertising lettering. Full instructions for home study. Information on membership courses on request. Guild School of Lettering, 324 Summit Ave., Hackensack, N. J.

HOW To sell drawings, photographs. Details free. Carlton, P-651 South State, Chicago.

AMATEUR Cartoonists wishing steady income copying and duplicating cartoons for advertisers, write Ad-Service, Argyle, Wisconsin.

SNAPPY! New! Hand drawn colored cartoons. Sure fire seller to bars and individuals. 25c brings sample 7x9 and details. Harbeck, 2320 Calumet, Chicago.

SHOWCARDS, Signs. Make them yourself. Quickly, artistically perfect. Any size lettering numbers. New method. System complete with instructions \$1.00. W. A. Boyd, Box 1907, Washington, D. C.

LEARN Cartooning then sell me your cartoons. Course 50c postpaid. DeChris, 4465 Leiper, Philadelphia, Penna.

BE A cartoonist— animator. We buy your cartoons when you learn by our method. Start at once! Send 25c for beginners charts and instructions. National Cartoon Features, Box 1901, Dallas, Texas.

CHALK Talks. Laugh producing program. \$1.00. Catalog 10c. Balda, the Cartoonist, Oshkosh, Wisconsin.

CARTOONING, Sketching, etc.—46 lessons, 600 illustrations, including drawing paper, pens, pencils. \$1.00 complete. Fraba Service, Cashton, Wisconsin.

PEN And ink illustrations for catalogue and general printing purposes at right prices. High grade work. Heraldic Studios, 1914 Oakdale Avenue, Chicago.

MAKE Art Pay. Advanced art students. \$1.00. Popular Mechanics, 200 E. Ontario St., Chicago.

ADVERTISING AGENCIES—LETTER WRITERS—FOR ADVERTISERS

MAILING List 128 manufacturers electric motors, washing machines, vacuum cleaners, 25c. Bochet, 1344 Buchanan, Minneapolis, Minn.

SELL Your product through agents, mail order. Advertise newspapers, magazines. Publishers' rates. Snappy layout your inch advertisement \$1. Martin Advertising Agency, 171M Madison Avenue, New York.

LEARN Advertising quickly at home. Easy practical plan. No text books. Common school education sufficient. Interesting booklet and requirements free. Page-Davis School of Advertising, 3601 Michigan Avenue, Dept. 3431, Chicago.

ORIGINAL Letters \$2, folders, booklets. Taylor-made, 1336-P North Clark, Chicago.

INCH, 28 Magazines, 3 months, \$3.00. Paramount Press, Atlanta, Missouri.

SELL By mail? Want agents? Our "guide-book" packed with helpful advice, rates, publications, sent for stamp. Chicago Advertising Agency, 20PK West Jackson, Chicago.

DIRECT-MAIL Advertising services. Sales letters that sell. Mailing lists. Omaha List & Letter Co., Box 2172, South Omaha, Nebr.

ADVERTISING Placed all magazines, newspapers, radio. Lowest rates. Free service. 54 page rate book free. Baker Advertising Agency, A-189 West Madison, Chicago. Successors to Ankrum. Established 28 years.

FREE—New Advertisers Rate Guide, 44 pages. Includes everything. Lowest rates. E. H. Brown Advertising Agency, 140 S. Dearborn, Chicago.

ADVERTISE: 24 Words in 250 newspapers \$10. Lists free. Advertising Bureau, 4515-C Cottage Grove, Chicago.

BUSINESS SERVICE

CHICAGO Mail address—phone service, daily forwarding, also secretarial service. Hancock Company, 43 East Ohio.

WHERE To buy anything! Wholesalers, manufacturers, 25c (coin). Jeans, 824 Prendergast, Jamestown, N. Y.

RUBBER STAMPS AND OFFICE SUPPLIES

ORIGINAL, Cushion mounted. One, two lines 25c; three 35c; four 45c. Facsimile signature \$1.50. Stamp Works, 814 Bradley, Peoria, Illinois.

2 LINES 25c, 3-35c, cushioned. Stamp Works, Centerport, N. Y.

GUARANTEED Typewriter ribbons, 35c delivered; adding machine ribbons, 50c. Economy, 126 Kinzie, Chicago.

2 LINES 25c, 3 Lines 35c. Stamp Works, Auburn, Nebr.

TYPEWRITERS, DUPLICATORS, OFFICE DEVICES

AUTOMATIC Adding machines. Adds, divides, subtracts, multiplies. \$2.50. Star, 5012 South Ashland, Chicago.

SPEEDY Printer is best all purpose duplicator. Pekas Duplicator Co., Lester-ville, So. Dakota.

INCREASE Business now. "Excelsior-graph" Rotary Stencil Printer reprints thousands everything you typewrite, hand-write, draw or trace. Colors, \$19.75 to \$44. Terms. Illustrated literature free to business or professional men. Pittsburgh Typewriter Supply, Department K-2, Pittsburgh, Penna.

NEW \$3.75 Automatic adding machine. Fully guaranteed. Bassett, Box 302-K, Altadena, California.

TYPEWRITERS, Adder, mimeograph, multigraph, addressograph. Send for free lists of machines that will help you at half price. Pruitt, 28 Pruitt Bldg., Chicago.

A. B. C. Shorthand System, \$1.00. Popular Mechanics, 200 E. Ontario St., Chicago.

PRINTING, MULTIGRAPHING, MIMEOGRAPHING, GUMMED LABELS

200 8½x11 BOND Letterheads, 200 6¾ envelopes \$1.00 postpaid. Franklin Printery, 2932 Pershing, Chicago.

5000 6¾ ENVELOPES; \$6.25—1000 Business cards; 85c (shipping extra). Reindeer Press, 1089a Lincoln Place, Brooklyn, New York.

QUALITY Mimeographing. 600—\$2.50. Free samples. Mimeocraft, Box 352, Lowell, Mass.

LETTERHEADS In raised gold. Nothing finer anywhere. Trifling cost. Samples, Details, dime. Refunded first order. U. Shumway, Painted Post, N. Y.

250 BOND Letterheads, 8½x11 and 250 envelopes, \$1.75 postpaid. Martin, 6071 Palmetto St., Ridgewood, N. Y.

125—8½x11 BOND Letterheads and 125 envelopes, both printed, \$1.00 postpaid. Benneville, 907 West Roosevelt, Philadelphia.

1000 BUSINESS Cards \$1.00; 125 Letterheads, 125 envelopes \$1.00, postpaid. Sechrist Printing Co., South Bend, Ind.

PRINTING—Lowest prices in America. Samples free. Plitz, Middle, Iowa.

SUPERIOR Printing, priced right. Grange work specialized. Art-Craft, Lanesboro, Mass.

\$1.89 THOUSAND—Quality envelopes; Hammermill papers. Cameron Printing, Thompsonstown, Penna.

2000 BUSINESS Cards \$1.50. Letterheads, statements, etc. Lowest prices. Florence Printing Company, 270 Lafayette Street, New York. (Salesmen wanted.)

QUALITY Printing, lowest prices. Samples. Tucker, P.O. Box 65, Indianapolis.

MODERN Two color letterheads. Reasonable. Fechner, 202 Ashland, River Forest, Ill.

MIMEOGRAPH Stencils. Letter or legal, \$1.75 quire (24). Guaranteed. Mishek, Waseca, Minnesota.

250 LETTERS Multigraphed (20 lines) \$1.45; also cut price printing. Multigraphers, Ashland, Virginia.

\$1.65 THOUSAND Envelopes! Agents wanted. Caslon, Worth St., Stamford, Conn.

6x9 CIRCULARS, Letterheads, envelopes, postcards, \$2.95 1000; 5,000, \$7.50-\$9.45. Folders. All printing low prices. Samples. Goodprint, Harrisonburg, Penna.

69c POSTPAID. 100 8½x11 Bond letterheads, 100 6¾ envelopes, both printed in beautiful rich blue ink. Attention! 500 letterheads mimeographed \$2.50. 500 letterheads multigraphed \$3.50. Lowest prices in U.S.A. Budenkaye Press, Plymouth, Penna.

135 8½x11 BOND Letterheads and 135 6¾ envelopes—only \$1.00. 1000 of either \$2.75. All postpaid! Beautiful work! Premier, 454 Christopher Ave., Brooklyn, N. Y.

500—5 LINE Gummed stickers, 3x2¼, 20c. O. P., Box 52, Flint, Michigan.

125 LETTERHEADS, 8½x11, and 125 envelopes, 6¾, printed, \$1.00, postpaid. Circulars, folders, booklets. Samples free. Pine Hill Printery, Freeman, South Dakota.

UNUSUALLY Fine printing reasonable. Hildebrand's, 4554 North Uber Street, Philadelphia, Penna.

500 LETTERHEADS, Envelopes, billheads 80c. B-Jco, 22 Fox, Worcester, Mass.

PROCESSED Engraved wedding or graduation announcements, 100 folders, envelopes, \$4.85. Letterheads, envelopes, circulars, 1000 \$2.75; 5000 \$9.25. Quality Printing, 416 Brook Avenue, Richmond, Virginia.

PRINTING, Quick incomparable workmanship, reasonable. Samples. Gibson-print, 5413 Calumet, Chicago.

BUSINESS Cards (raised printing) 250—\$1.75. 500—\$2.35. C-R Company, Rosedale, New York.

SPEND Less for quality printing. Free details. Bechtol Printing, 2025 Central, Kearney, Nebr.

135 EACH Letterheads, envelopes, \$1.00 postpaid. Kressman, Washington, New Jersey.

ENVELOPES, 500, 6¾, \$1.00. Morey Press, 87 Somerset, Springfield, Mass.

1000 STICKERS, Four lines, 50c. Fine labels. Cott's, Spickard, Missouri.

HAMMERMILL Letterheads, 300 8½x11, any color paper and ink, \$1.48 postpaid. Free particulars. Woodruff's, 217A Lewis, Duluth, Minnesota.

PRINTING? Get lowest prices. Churchill, 4316 South Salina, Syracuse, N. Y.

500 3½x2½ **FOUR** Line gummed stickers, 25c. Moritz Printery, Saginaw, Mich.

THOUSAND Envelopes, 6½, \$1.75. Bohman, 13 State, Schenectady, New York.

HAMMERMILL Letterheads, 1,000, \$3.50. Reply cards, 1,000, \$5.50. Press, Plano, Ill.

PRINTING OUTFITS AND SUPPLIES

PRINT Your own cards, stationery, circulars, advertising. Save money. Easy rules furnished. Print for others, big profits. Junior outfits \$9.00, senior outfits \$17.00 up. Details free. Kelsey Presses, E-11, Meriden, Conn.

6x9 **STEEL** Casters \$3.95. Casting, dime. Service, 1466 Broadway, Haverhill, Mass.

MAKE Halftone cuts, trifling cost, with ordinary photographic equipment. Photographic halftone screen (5x7x85) \$5 with complete instructions. Instructions only, \$1. Fotocolor, 1472 Broadway, New York.

TYPELESS Printer prints from post card size to 8½x14 inch sheet—low price, free details. Professional Products, Dept. 510, Silverton, Ohio.

PRESSES, Type, cabinets, supplies. Send stamp. Lincoln Press, 226 Hartwell, Fall River, Mass.

BARGAINS — Presses, type, supplies. Send stamp. 159 Harvard, Cambridge, Mass.

LONG Established printers warehouse. Big lists 3c. Landis, Richland, Penna.

HAND Presses, type and complete printers' supplies. Send stamp for catalog and new price list. P. Peiffer & Co., Newark, N. J.

USED Presses, type, supplies. Lists 3c. Turnbaugh Service, Loysville, Penna.

BARGAINS, Presses, type. List 3c. Exchange, E-15, 119 Dexter, Meriden, Conn.

4 **COLORS** Printing inks 50c. sample 20c. Elsen, 4511 - 4th Avenue, Brooklyn, N. Y.

PATENT ATTORNEYS

INVENTORS: Send immediately for your copies of our new free books, "Patent Protection" and "Suggestions on Selling an Invention." Sixty-eight pages of interesting facts. They tell how Patent Laws protect you; kind of sketch or model needed; simple steps to take without cost; how successful inventors have secured financial assistance; show interesting inventions; illustrate important mechanical movements. With books we also send free Evidence of Invention form to help establish date of disclosure. Prompt service, reasonable fees, special deferred payment plan. Strictest secrecy. Forty-one years' experience. Highest references. Write us today. The facts in our books are worth money to the man with a good invention. Address: Victor J. Evans & Co., Registered Patent Attorneys, 113-E Victor Building, Washington, D. C.

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INVENTORS—Before disclosing your invention to anyone send for form "Evidence of Conception"; "Schedule of Government and Attorneys' Fees" and Instructions. Sent free. Lancaster, Allwine & Rommel, 411 Bowen Building, Washington, D. C.

"**INVENTOR'S** Guide." 100 mechanical movements, free; advises on patenting, selling inventions. Frank Ledermann, Tribune Bldg., New York.

L. F. RANDOLPH, 302-B Victor Bldg., Washington, D. C. Low cost. Book and information free.

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EXTENDED Laboratory facilities now offer expert consulting service for inventors' problems in electricity, chemistry, mechanics, electrochemistry. Flat fee basis. Unless assistance rendered no payment required. Inventors Research Service, 135 University Ave., Rochester, N. Y.

MODELS, Special machinery and manufacturing of metal specialties. Pierce Model Works, Tinley Park, Ill.

200 **MANUFACTURERS** Wanting new ideas. 25c. Glen Sigafosse, 56 West Washington, Chicago.

WE Locate buyers meritorious patented, unpatented inventions. If will sell, reply immediately. Descriptive booklet free. Invention Reporter, 5A-11236 South Fairfield, Chicago.

INVENTORS Four day convention and exhibit will be held in Chicago, June 6th to 9th. Send stamp for details. National Inventors Congress, LaSalle Hotel, Chicago.

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HAVE You a sound, practical invention for sale, patented or unpatented? If so, write Chartered Institute of American Inventors, Dept. 4-A, Washington, D. C.

FINANCIAL Assistance for invention to be patented. Working models built. E. Worsham, Box 1356, Washington, D. C.

INVENTORS: Profit by your invention. A practical talk to inventors by an experienced manufacturer. Our 68 page booklet "Mind vs. Matter" mailed upon receipt of 25c. Rex Engineering Co., Cincinnati, Ohio, Dept. D.

INVENTORS: "Making Inventions Pay," our 32-page illustrated book, mailed upon receipt of 3c postage. Crescent Tool Co., Dept. Z, Cincinnati, Ohio.

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I **SELL** Patents. Established in 1900. Charles A. Scott, 773PM Garson Ave., Rochester, N. Y.

INVENTORS Consultant. Appraise applicability, patentability and marketability. Write C. G. Hall, 3133 Connecticut Ave., Washington, D. C.

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PRACTICAL Inventions wanted. Full protection guaranteed. Write for "4-Point Service" bulletin. R. & S. Engineering Company, 17 East 42nd Street, New York, N. Y., Dept. P-5.

WANTED—Meritorious patented, unpatented inventions. Booklet free. Invention Reporter, 5B-11236 South Fairfield, Chicago.

IF You'd like steady income inventing for special markets, write for my booklet "Cashing In On Unpatented Ideas." Stamp appreciated. Hendrickson, Argyle, Wisconsin.

INVENTIONS Wanted for promotion to manufacturers. Howard Frank, 55 West 42nd, New York.

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INVENTORS: Sell your idea direct. We furnish names, capital rating, any type manufacturer. Dime brings information, Garinger, Associates, Box 1959, Chicago.

SMALL Inventions wanted by manufacturers. I'll help you sell your invention. Write for free circular. Stanley Hull, 7829-K Euclid Avenue, Cleveland, Ohio.

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PATENTED, Hand operated machine for cleaning air filter on automobile engines. Efficient, handsomely designed. Service stations, garages, fleet owners, make exceptionally large market. Charles Lester, Kimball, West Va.

MARINE Reverse gear—patented, 100% reverse. Free wheeling. Adaptable for all automobile and marine conversion. Tested and proved absolutely dependable. Charles Heckman, 321 Trinity Place, West Palm Beach, Fla.

SALE Or royalty. Any car theftproof using my patented license holder. Simple but safe. It's tamperproof. Neat on all late cars. Good for replacements. Cheap to manufacture. J-P, Box 4336, Takoma Park, D. C.

MANUFACTURERS: For new products or profitable manufacturing opportunities, inquire, Invention Reporter, 5C-11236 So. Fairfield, Chicago.

DIES, Patent, copyright including 1800 metal golf kits. Never marketed. Must sell. Link, 4341 Monroe, Gary, Ind.

COMBINATION Lead pencil clip and sharpener. Home shoe polisher holder. Automobile valve adjusting wrench. Chester Munmert, 810 No. 6th St., Harrisburg, Penna.

SELL Your patent through a small classified ad in Popular Mechanics. Many inventors have found buyers in this way. Ask me for proof—I'll gladly send it to you. P. W. Johnson, Manager Classified Advertising, 200 E. Ontario St., Chicago.

MANUFACTURING

INVENTIONS Manufactured in any quantities. Tools, dies, metal stampings; working models built; industrial designing. Complete blueprint and engineering service. Write for "4-Point Service" bulletin. R. & S. Engineering Company, 17 East 42nd Street, New York, N. Y., Dept. PM-5.

MANUFACTURING At low cost. Dies, stampings, wire forms, spot welding. Southern Products, P59, Independence, Missouri.

INVENTIONS — Manufactured in any quantity at low cost by old established company. Stampings, metal specialties, dies, models, etc. Free estimates. Send for catalog. Crescent Tool Co., Dept. X, Cincinnati, Ohio.

INVENTIONS Manufactured by an experienced company, in any quantity at low cost. Metal specialties, novelties, stampings, dies, and models. Free estimates. Our booklet "Mind vs. Matter" sent upon receipt of 25c. Rex Engineering Co., Cincinnati, Ohio, Dept. C.

MODELS AND MODEL SUPPLIES

SHIP Model kits, fittings. Catalogue 5c. Polk's, 429 Seventh Ave., New York.

AUTHENTIC Kits for period reproductions of historic houses. Super detail custom models of historic and modern boats and aircraft. Prices on request. Atkins Better Craftsmanship, The ABC of Model Making, P.O. Box 416, Natick, Mass.

CATALOGUE Of over 40 engines, castings, supplies, 25c. Refunded. Howards, A-2417 North Ashland, Chicago.

LIVE Steam locomotives \$9.50 to \$200. Catalogue 25c. Steam-Electric Company, Bloomfield, N. J.

MODEL Midget racer kits make your favorite midget racer easy to build. Postpaid 60c. Hollywood Hobbies, 9423 Pico Blvd., Los Angeles, Calif.

MODEL Airplanes, boats, trains, and motors. Complete supplies. Immediate shipments. Catalog 10c postpaid. Model Builders Supply, 2328 Danforth, Hamtramck, Michigan.

HOMECRAFT And model supplies. 1939 catalog now ready 10c. Hobby Supply House, Box 2014, Pittsburgh, Penna.

SPEED Boat hulls. kits \$3.25 up. Literature. St. Louis Model Boat Co., 225 N. Meramec, Clayton, Mo.

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MINIATURE Boat and airplane supply catalog 5c. Selley, 1377 Gates Ave., Brooklyn, N. Y.

MODELS—Your ideas developed into practical working models. 30 years successful experience; thousands of satisfied customers. Confidential service guaranteed. Bank references. Send 3c postage for our large booklet—"Making Inventions Pay." Crescent Tool Co., Dept. Y, Cincinnati, Ohio.

RAILWAY Models. Catalog handbook 25c. Walthers, 247 E. Erie, Milwaukee.

BUILD Miniature gasoline motors. Fascinating, educational, profitable. Details, drawing, 10c. Wright Motor Works, 3256 Lake Park Ave., Chicago.

MODEL Railroad Shop. Dept. PM, Dunellen, New Jersey. New 24 page illustrated catalog 10c postpaid.

SHIP And yacht model fittings; construction sets; model yacht sails; illustrated catalog 20 cents. A. J. Fisher, 1002-1 Etowah Avenue, Royal Oak, Mich.

MODEL Supplies for the inventor. Send 3c stamp for catalog. Pierce Model Works, Tinley Park, Ill.

MODELS—Practical models put over your ideas. We develop models from the crude to perfect working devices. Your idea might have large commercial value. Services confidential. Bank references. Registered graduate engineers at your service. Send 25c for our 68 page booklet "Mind vs. Matter." Rex Engineering Co., Cincinnati, Ohio, Dept. B.

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HOME CRAFTSMEN

3c STAMP Brings latest price list rare lumber, veneer, inlay pictures, etc. Woodcraft Supply, 413 N. Hoyne, Chicago.

KNOCKDOWN Furniture, lumber, plywood, veneers. Illustrated catalog 10c. Giles-Kendall Co., Decatur, Alabama.

NEW Manual for tool users free. Tells you how to use and care for your tools; how to sharpen your saws. Write Henry Disston & Sons, Inc., 511-C Tacony, Philadelphia, Penna.

20 FULL Size lawn ornament patterns 25c. Wickman, 744 Brooklyn, Dept. 29, Darton, Ohio.

BORING Bar for small diameters. Very rigid. Blueprints 35c. Craftsman's House, Avoca, Penna.

TURN Alabaster! Four butts, f.o.b. \$1.00. Demonstrators, 1743 Harrison, Chicago.

MAKE Mats from junk tires. Instructions \$2. Thomas Kowell, 5372 St. Clair, Detroit.

MAKE Leaded antique lanterns. Free description folder. M. Ascherl, Lorain, O.

22 FULL Size lawn ornament patterns 25c coin. Strother, Box A-383, Belington, West Virginia.

CHAIR Cane, reed, webbing, seating materials. Fogarty, Caner, Troy, N. Y.

MAKE Beautiful artistic roc-veneer urns, birdbaths, etc., by unique system. Inexpensive. Write Roc Veneer System, Brady, Texas.

EXTRAORDINARY Guaranteed wood-working moneymaking opportunities. Information. Illustrated thirty-six page catalog 10c. (refunded). Woodcraft Service, Plainview, Minnesota.

20 LAWN Ornament patterns 30c. 20 novelty patterns 30c. 14 silhouette patterns 30c. 15 lawn ornament patterns different from those above 30c. All for \$1.00. Modern Woodcraft, Saginaw, Michigan.

LEATHERCRAFTSMEN—Write for free instructions and price list of leather, tools, etc. Sample cards 5c. Wilder & Co., Dept. F, 1038 Crosby St., Chicago, Ill.

WOODWORKERS Dowel templet makes perfect joints. \$1.25 prepaid. Fred Fay, Meadville, Penna.

1001 WAYS to Use Concrete. Send for large free illustrated folder describing new Popular Mechanics book covering every known use of concrete for the home, farm, building, business and industry. Popular Mechanics Press, Room (C38), 200 E. Ontario St., Chicago.

OLD GOLD. WATCHES, JEWELRY, PRECIOUS STONES

10 DIAMOND Platinum wedding rings. \$28.00. Pistilli Brothers, Bridge Street, Newark, N. J.

HIGHEST Prices for old gold—Mail your teeth, watches, jewelry. 100% full cash value mailed day shipment received. Satisfaction guaranteed or articles cheerfully returned. Information free. Chicago Gold Smelting Company, 300-P Champlain Building, Chicago.

5000 REBUILT Elgin, Waltham, Hamilton watches. Also ladies, gents wrist watches. Make big money! 12 size, 7 jewel, Elgin or Waltham, \$4.75; 16 size, 17 jewel, \$7.50. Send for free watch and diamond catalogue. The New York Jobbers, Dept. M, 74 Bowery, New York, N. Y.

WATCHMAKERS' Supplies, tools, watches. Sold—purchased. Ben Segal Company, 5 So. Wabash, Chicago.

WATCHMAKERS' Repair service. Save half. Paul Jewelry Co., LaCrosse, Wis.

AUSTRALIA'S Lovely opals. Illustrated catalogue free. Good selection \$5. Norman Seward, Melbourne, Australia.

GOLD \$35 Ounce. Ship old gold teeth, crowns, jewelry, watches—receive cash by return mail. Satisfaction guaranteed. Free information. Dr. Weisberg's Gold Refining Co., 1500-Q Hennepin, Minneapolis, Minn.

FOR THE HOME

EASILY Built lawn chair, plans 50 cents. Carver, 1322 29 Street, South Bend, Ind.

REFINISHING Your furniture made easy! Complete instructions 35c (coin). Todd's Service, 53 McGuffey, Youngstown, Ohio.

SMELLY Shoes? Self addressed stamped envelope brings information about shoe hygiene and free sample. Shu-Sweet, Box 1066, Santa Fe, New Mexico.

TOBACCO

GUARANTEED: Cigarette, pipe or chewing, 5 lbs. \$1.00, ten \$1.75. Pay when received. Pipe and box cigars free. Rives Tobacco Co., Paducah, Ky.

FOR SALE—MISCELLANEOUS

FOR Sale, new and used marble games guaranteed. Write for lists. River Amusement Co., 152 West 42nd St., New York City.

WANTED—MISCELLANEOUS

CASH For used microscopes, binoculars, cameras, slide rules, drawing sets, surveying, mechanical, and scientific instruments. Highest prices paid day shipment received. Satisfaction guaranteed or shipment promptly returned. Elman's, 2302 Van Buren, Chicago.

PERSONAL

NERVOUSNESS! Afflicted? Feel discouraged? Overcome your fears! Free (personal) information. Investigate! John Englund, Ps.D., Ironwood, Mich.

NEWLY Discovered dandruff remover. 50c. Shumer's, 181 Rockaway Parkway, Brooklyn, N. Y.

WHOLESALE! Five large milk magnesia toothpaste \$1.00, sample 25c. Jocar, Wellesley, Mass.

TREASURE Finders? Read Goldak advertisement on page 137A.

EMBARRASSED By smelly shoes? Shu-Sweet prevents that odor. Money-back guarantee. 25c postpaid. Shu-Sweet, Box 1066, Santa Fe, New Mexico.

SCALP Disorders banished forever! Prevent baldness, dandruff, falling hair, itching. Results guaranteed. Details free. 115 Church, Foxchase, Philadelphia.

DEAFNESS Is misery. Abell's invisible ear drums recommended. Free book, Dr. Abell, Slavin Bldg., Pasadena, California.

GOOD Eyesight without glasses. No drugs. Surprisingly simple treatment. Guaranteed. A. Jacobson, Upsala, Minn.

WIN Prize money: Booklet—"Successful Contesting"—shows how. 10c postpaid. Bulletin listing \$200,000.00 prizes included. World Publishers, 4515-B Cottage Grove, Chicago.

SMALL Business of Your Own. 1000 tried and proven methods. \$1.00. Popular Mechanics, 200 E. Ontario St., Chicago.

MISCELLANEOUS

LAM-A-FAB. The cloth cement, acid and waterproof. Permanently repairs anything made of cloth. Sails, hunting equipment and suits, football suits and athletic equipment, rugs, canvas chairs and work clothing. S. J. Russell Co., P. O. Box 187, Peoria, Ill.

NITE Lite, switch, adjustable shade, plugs into any outlet. 25c coin postpaid. Erman's, Monroe, Mich.

COCOONS. Butterflies, collectors' supplies, free lists. Maynard, 1192 Lewiston, Rochester, N. Y.

MEXICAN Scenic postcards: Two, 12c stamps. Free remailing service. Marquez-PMD, Apartado 1176, Mexico City.

TATTOOING Outfits, world's fair electroetching machines. "Waters," 985 Putnam, Detroit.

BUSINESS Proposition restilvering mirrors, autographs, reflectors, making chipped glass signs. Write, Sprinkle, Plater, 288, Marion, Indiana.

ELECTRIC Razors \$1.00. Books, tricks, novelties. Bryant, 857 West Broad, Columbus, Ohio.

"SECONDS" High grade men's socks, latest fashions, all colors, six pairs \$1.00. Watertown Specialty Co., P.O. Box 88, Watertown, Massachusetts.

GET Informed: Latest bulletin fluorescent and other high priced rocks and minerals; interesting, profitable. 15c stamps. Brandex Laboratories, Box 180, Oakland, California.

ABUNDA-GRO Performs planting miracles without soil. Unique Club, Upsala, Minn.

MONEY In butterflies, moths. See Sinclair Display Advertisement on page 14A.

LUMINOUS Paint shines in the dark. 10c bottle. Myers, 211 Broadway, Niles, Michigan.

AMATEUR Tattooing outfits. Free circular. Tatuco, A-651 South State, Chicago.

AMATEUR Cartoonists wishing steady income copying and duplicating cartoons for advertisers, write Ad-Service, Argyle, Wisconsin.

PLASTICS: Introductory kits from 55c postpaid. Free catalog. Carlson Plastics Products, 70 Fox, Buffalo, N. Y.

BOOK, 500 Useful kinks. Engineers, janitors. \$1.00. Mikkelsen, 4832 45th Ave. S. W., Seattle, Wash.

TREASURE Finders? Read Goldak advertisement on page 137A.

SMELLY Shoes? Shu-Sweet prevents that odor. Simple to use. Money-back guarantee. 25c postpaid. Shu-Sweet, Box 1066, Santa Fe, New Mexico.

SWAPPER'S Friend, R4, Saline, Michigan. Interests swappers, collectors. 50c year, sample 10c.

COATS-OF-ARMS And crests correctly rendered in colors or black and white. Highest grade. Estimates free. Heraldic Studios, 1914 Oakdale Ave., Chicago.

10,000 MONEY-MAKING Formulas. Tells you how to make and sell almost everything under the sun; cosmetics, mucilage, anti-freeze solutions, battery solution, beverages, cheese, chewing gum, cleaning preparations, extracts, hair preparations, inks, bluing, leather polish, mirrors, perfumes, polishes, typewriter ribbons, carbon paper, washing powders, liquid soap, and hundreds of other profitable articles. \$4 postpaid. Popular Mechanics Press, Room (C38), 200 E. Ontario St., Chicago.

OL' JUDGE ROBBINS

MY, WILL THIS CITY EVER BE FINISHED! THOSE TELEPHONE MEN ARE AT IT AGAIN, EH, DAD?

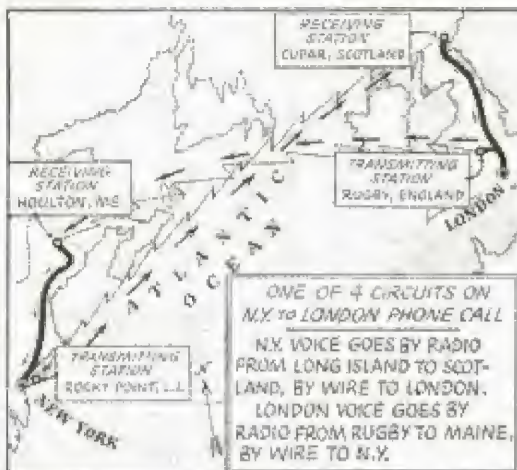
GOSH, THAT REMINDS ME — WE WERE TO VISIT THAT BIG TELEPHONE EXCHANGE!

IN NEW YORK
THE
TRANSOCEANIC
TELEPHONE

JUST THINK — HUNDREDS OF OPERATIONS TO COMPLETE A DIAL PHONE CALL!



YES — BUT OUR OVERSEAS SERVICE IS EVEN MORE INTERESTING



WE CAN REACH THE LONDON OPERATOR BEFORE YOU COULD TAKE A DOZEN PUFFS FROM A PIPE-LOAD OF PRINCE ALBERT



CAN ANYONE WITH A RADIO LISTEN IN?

YES, BUT IT WOULDN'T SOUND LIKE ANYTHING. THE RADIOED WORDS ARE "SCRAMBLED" AND REASSEMBLED



"JUDGE ROBBINS" IN TELEPHONE CRYPTIC (SCRAMBLED WORDS) SOUNDS LIKE "BLURZ RADDIMIZ"

THIS IS THE 'VOICE MIRROR.' SPEAK INTO THAT PHONE AND YOUR VOICE WILL ECHO BACK THROUGH THE THREE RECEIVERS



THERE'S NO OTHER TOBACCO LIKE PRINCE ALBERT!

THERE'S NO OTHER TOBACCO LIKE PRINCE ALBERT!



YOU'LL GET THAT ECHO FROM A LOT OF PIPE-SMOKERS, TOO, JUDGE! P.A. CERTAINLY SHOWED ME HOW MILD AND TASTY A TOBACCO CAN BE

Copyright, 1939, R. J. Reynolds Tobacco Company

Hello! Smokers...



I CREDIT MY PIPE PLEASURE TO PRINCE ALBERT. IT'S **COOLER, MELLOWER** WITH **GOOD, RICH BODY!**

P. A. IS TASTIER, TOO, IN "MAKIN'S" CIGARETTES. ROLLS FASTER, NEATER AND SMOKES SLOWER

50 pipefuls of fragrant tobacco in every handy tin of Prince Albert



P.A. PLEASES OR "REVERSE THE CHARGES!"

Smoke 20 fragrant pipefuls of Prince Albert. If you don't find it the mellowest, tastiest pipe tobacco you ever smoked, return the pocket tin with the rest of the tobacco in it to us at any time within a month from this date, and we will refund full purchase price, plus postage.

(Signed) R. J. Reynolds Tobacco Company, Winston-Salem, North Carolina

PRINCE ALBERT

THE NATIONAL JOY SMOKE

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Popular Mechanics Magazine

REGISTERED IN U. S. PATENT OFFICE AND CANADA

WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 71

MAY, 1939

No. 5

Magic TUBES of DAYLIGHT



RIGHT next to Edison's invention of the carbon filament lamp and the later introduction of tungsten filaments, put the new fluorescent "daylight" lamp. Lighting engineers call it the third milestone in man's conquest of night by electricity.

For a long time they have wanted to wave a wand or mix a magic powder to create a really accurate and inexpensive imitation of daylight. Today they have both wand and powders—a tube of glass and an assortment of inorganic chemicals in powdered form; together, the fluorescent lamp.

Patient research has resulted in the perfection of powders or "phosphors" to generate practically any color desired. Fluorescence, an old friend you first met in physics class, is the basis of the lamps. There are certain chemicals that, under



Left, using "daylight" lamps beside boudoir mirror for daytime makeup; warmer light can be used at night. Right, placing twenty-watt fluorescent tube in fixture

Northlight Mfg. Co. 641



invisible, short-wave light, produce visible light. Ordinarily, when any light is absorbed, the energy it contains is transformed into heat. But in fluorescence, the absorbed radiation makes the molecules of the material vibrate in such a manner that visible light is given off instead of heat alone. Always, the wave length produced is longer than that absorbed. A familiar device that has employed fluorescence for years is the fluoroscope, used to make X-ray images visible.

Ultraviolet radiation, which activates the phosphors, is produced by a mercury arc, started by heating coiled tungsten electrodes at each end of the tube and then automatically breaking the circuit through the electrodes to permit the current to flow through the arc. There is a small amount of argon gas in the lamp to make starting easier.

When light of a single color is desired, one kind of powder is used in the tube. By careful blending of three powders, white light is produced. The propor-

tions can be varied to give almost any desired color. In this way, artificial daylight more like natural daylight than anything produced before at comparable efficiencies has been made possible.

Incandescent lamps, equipped either with a blue-green bulb or a special glass filter, were the best daylight sources until the fluorescent lamp came along. The efficiency of producing artificial daylight with incandescent lamps is low, only ten to thirteen lumens per watt; and when a filter is used for more accurate color characteristics, it falls to one to five lumens per watt. Yet 50,000,000 daylight lamps and many thousands of color-matching devices using daylight filters have been sold. The daylight fluorescent lamp is more than twice as efficient as the daylight incandescent, and delivers thirty lumens per watt. All the fluorescent lamps excel in efficiency as compared with incandescent sources. With colored lamps, the differ-



Top, fluorescent lighting in indirect trough fixture. Center, cool "daylight" desk lamp. Below, illuminating work surface in kitchen with the new tubes

Isenright Electric Co



ence is especially pronounced. A green incandescent lamp has an efficiency of one or two lumens per watt, while the green fluorescent lamp, most efficient of all because its radiation is near the region of the spectrum where the eye is most sensitive, develops fifty to sixty lumens for each watt consumed.

Fluorescent lamps are made in three different lengths, two bulb diameters and five colors besides daylight and warm white: green, blue, red, pink, gold. Each lamp consumes about ten watts for each foot of length, the longest being thirty-six inches.

The lamps are more rugged mechanically than filament lamps because they have no delicate filament to break. The coiled electrodes are so sturdy and operate at so low a temperature that they are not likely to be damaged by mechanical shock, or to burn out as do ordinary lamp filaments. However, fluorescent lamps do have one or two weaknesses, but these will, in time, be eliminated or reduced.

Chief of these is the fact that the lamps are sensitive to temperature. The mercury-vapor pressure inside the tube must be at a certain value for the lamp to operate most efficiently. When the temperature goes up, the pressure becomes greater, and



Top, left, daylight tubes in railroad car; right, fluorescent lamps help match paintings with color press proofs. Below, "outdoor" light in fur salon

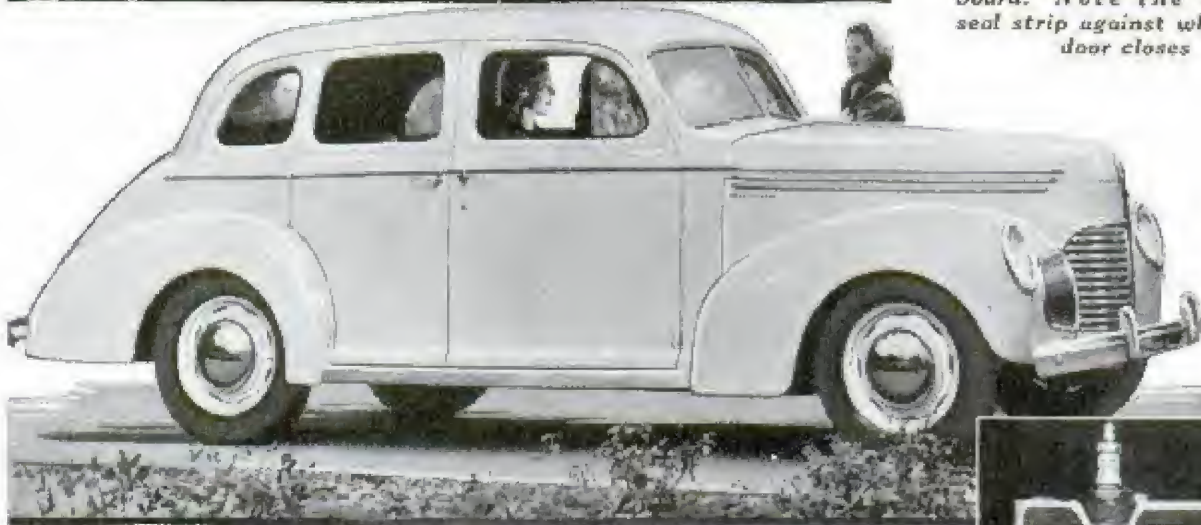
(Continued to page 146A)

Lightweight Auto Designed to Give Economy

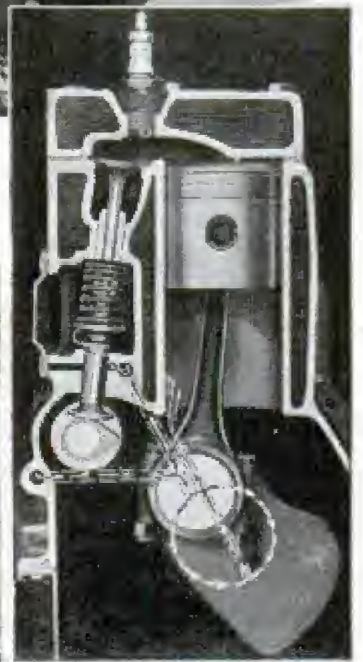
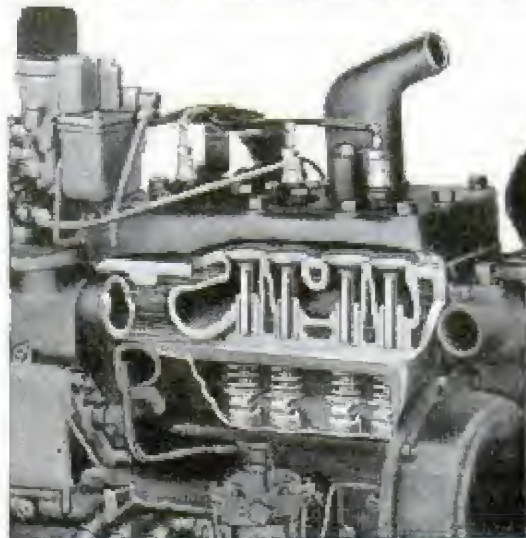


Champion

Left, driving compartment of the new lightweight Studebaker. Note that the gear lever is located beneath the steering wheel. Circle, door opened to show construction details resulting from omission of running board. Note the weather seal strip against which the door closes



Center, exterior view of the new car, demonstrating the styling in the manner of Raymond Loewy, including headlamps set flush into front fenders. Bottom, left, cutaway view of the six-cylinder engine shows how water jackets extend the full length of the cylinders to give efficient cooling. Bottom, right, another cutaway, of a cylinder, to show cooling and oiling passages. Motor design is simplified to achieve a reduction in weight, as well as to improve performance. The engine delivers seventy-eight horsepower and the car weighs slightly less than 2,400 pounds, a combination resulting in unusually low fuel consumption



New Auto Marks Trend to Lighter Weight

Representing a new trend in the automobile industry—that of lightweight construction to achieve exceptional economy without sacrifice of performance—a new Studebaker has just been introduced. The car will sell in the lowest price field of standard size automobiles. Produced in three models, four-door sedan, two-door sedan and coupe, the Champion, as it is called, weighs approximately 2,400 pounds. It is powered by a six-cylinder engine that develops seventy-eight horsepower and delivers more than twenty-five miles per gallon of fuel. The transmission is three-speed synchro-mesh, operated by gear lever located under the steering wheel. Front suspension is of the planar type, pioneered by Studebaker. The car is equipped with hydraulic brakes. The frame is said to be thirty per cent lighter in weight but stronger than competitive car frames. Liberal use of welds and reinforcements serves to make the frame a closely knit unit. A weight saving also has been achieved in the engine, which is about 200 pounds lighter than competitive motors. It has a comparatively short crankshaft, lightweight reciprocating parts, short, lightweight connecting rods, large Celeron gear for driving the camshaft, full pressure oil system, aluminum alloy pistons, water jackets extending the full length of cylinder walls and a high turbulence combustion chamber with a compression ratio of 6.5-1. The body is all-steel, the headlamps recessed into the fenders. Attractive styling of the Champion is the work of Raymond Loewy, industrial designer. There are no running boards and door hinges are concealed. Rotary door locks are standard equipment. Available for installation on the new car is the overdrive.

Portable Steel Air-Raid Shelter

Has Room for Four Persons

tested in London, England



Air-raid shelter standing under collapsing wall in severe test simulating war conditions remained undamaged from shock

Britain's drive for air-raid precautions has brought forth the development of a bell-shaped steel shell able to withstand the shock of falling bricks or shrapnel. Four people can occupy one of the shelters and come out unscathed even if a wall tumbles upon it, as demonstrated in a recent test.

One-Man Yacht Model Built to Scale from Thirty-Three-Footer

Just big enough to carry a "crew" of one, a scale model power cruiser has been built by a California craftsman. Patterned after a thirty-three-foot boat, the yacht is only eight and one-quarter feet long, with a twenty-eight-inch beam, and draws six inches. A three-quarter-horsepower motor drives her tiny bulk at six to ten miles an hour.



Undersized boat built to scale of three inches to the foot carries one man at ten miles per hour

*W. H. Letcher, Jr.
1521 S. Western Ave.
Los Angeles*

Tractor from Junked Cars Does All the Garden Work



Homemade tractor assembled from parts of junked automobiles does all the garden work, also mowing and rolling lawn

To save hand labor in his garden, the owner of an acre of ground assembled a tractor from parts of automobiles purchased at junk yards for seventy-five dollars; the motor, which was new, costing sixty-three dollars. Front wheels and tires came from a Buick, while the rear wheels were made from Chevrolet brake drums. An old Star car yielded the gear box, and a model "T" Ford the axle. There are four forward speeds and reverse, and the tractor makes fifteen miles an hour. An ingenious belt drive forms the clutch, the engine being shifted laterally until the belt is taut or slack. Cultivator, roller, lawnmower, scraper and harrow are interchangeable. Each tire carries about 100 pounds of water to increase the weight.

Folding Grill for Top of Stove Cooks Both Sides at Once

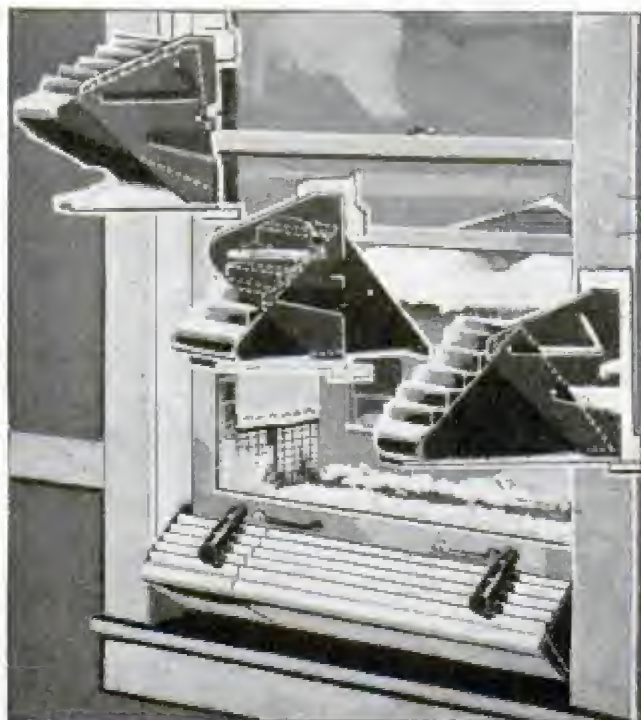


Meat can be cooked uniformly on both sides at the same time in a folding grill that is used on the top

burner of any flame-type stove. The upper cooking plate, hinged to the lower, rests on the meat or toast with just enough pressure to transfer heat without crushing. The lower plate is heated directly by flame, the upper takes its heat from the hot gases which pass through ducts and baffles of a circulation system and finally escape through eight long windows in a chimney along the top. It takes four minutes to bring the grill to full heat, which is indicated by a button rising from the top of the chimney; cooking is then very rapid. Made of aluminum and steel, the grill has a cooking space five and a quarter by eight and three-quarters inches. It takes two to four minutes to grill a steak.

Ventilator Cleans Air and Stops Drafts

Clean outside air flows into the room without creating drafts through an adjustable window ventilator that removes particles of dirt and dust. An eddy current is produced in its interior, depositing all heavier-than-air material into a dustpan which is cleaned easily. On leaving the ventilator, the air is



Metal window ventilator. Inset, left to right, shows three adjustments from closed position to fully open

Universal Button Badall Engineering Co. 2250 W. 7th St. and Mfg Co.

directed toward the ceiling so drafts are not possible, and many adjustments are obtainable to provide for admission of fresh air in stormy and wet as well as during calm, dry days. It is made in five sizes for windows ranging from sixteen to sixty-eight inches wide.

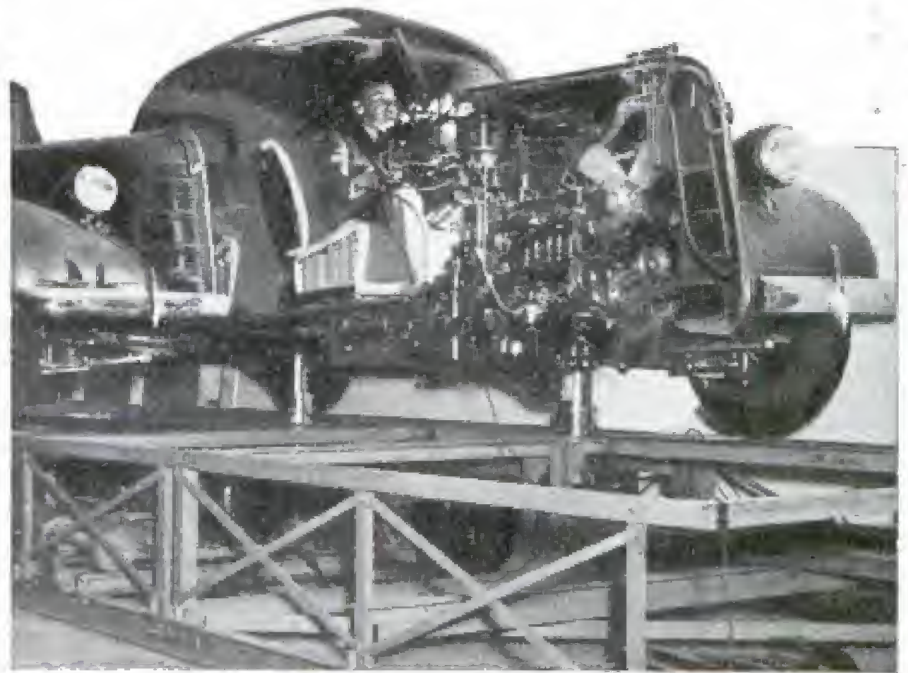
Still Camera Teams with Movie on the Same Tripod

When you are taking movies of a good action scene you lose many a chance for a perfect snapshot with your still camera. A twin assembly unit now available makes it easy to operate both cameras at once. Still and movie cameras are fastened side by side on the unit which is mounted on a single tripod, and the shutter of the still can be snapped without disturbing the movie operation.



Without disturbing action of movie camera, still pictures can be snapped with camera on twin mount

Museum Auto Sliced in Half Runs at Touch of a Button



When visitor to Rosenwald Museum presses button, half of this "sliced" automobile moves forward and exposed engine is seen in action

Visitors to the Rosenwald Museum of Science and Industry in Chicago may press a button and watch the wheels go around in a cutaway automobile. The car is sliced in half vertically, one half, including the driver's seat and motor, moving forward on a track to permit full view as the exposed pistons slide up and down in the cutaway cylinders. The demonstration is electrically operated.

New Weir above Niagara Falls Adds to Power and Beauty

Hidden beneath the rushing waters of the Niagara river, less than a half mile above the falls, is a concrete weir recently completed by a Canadian power company. Its purpose was to divert a larger volume of water to the plant and bring it to the level that existed when the power station was installed thirty-five years ago, but it has also directed a greater volume of water to the crest of Horseshoe Falls and thus enhanced its beauty. The weir is submerged throughout its length of 930 feet.

Of the 3,996,754 automobiles built throughout the world in 1938, the United States produced 2,489,635; the United Kingdom 447,561; Germany 328,000; France 220,343 and Russia 215,000.

The Thalammar

Automotive Industries

Approved by Dept. of Equipment
L. B. Wilson, New York Central R.R.
Chicago

At the THROTTLE



By Lou Wilson

Veteran Engineer of the
20th Century Limited

As Told to Julian Leggett

ROARING along at seventy to eighty miles per hour, with 900 tons of steel pounding the rails behind his big locomotive, the engineer has even more to think about than his schedule and the safety of 150 or more passengers.

Watching the public—that part of it that I can see from my cab—is perhaps the most important part of my job. Of course, there is the feeling of great responsibility for my passengers, but in time that becomes instinctive. As I sit at the throttle, I keep thinking about automobile drivers and pedestrians. Four-wheel brakes can stop the modern car quickly, but the way many drivers use them is enough to give every engineer a bad case of the jitters. I see an automobile coming, but I don't know what the driver is going to do. Per-



Top, Engineer Wilson at the throttle. Bottom, the "Century" pulling out for long run between Chicago and New York

haps he will speed right up to the crossing and stop on a dime—or he may ignore ringing bells, flashing lights and the locomotive's warning screech to shoot over the crossing, without more than a couple of inches to spare. If the motorists would slow up as they approach a crossing, the engineer would breathe easier because he

298

of the "CENTURY"



would know they had a better chance of hearing his whistle and more time to stop.

The pedestrian is my other big worry. That man standing beside the track ahead of me may decide suddenly to cross. Some people walking the track will stay on until the locomotive is almost on top of them. Then they step off, the engine pilot fanning their coattails. Ignorant of their close brush with death, they sometimes laugh at me.

These fellows who turn the engineer's hair gray by taking chances don't seem to know that it's impossible for me to stop the thirteen to fourteen-car "Century" in much less than one-third of a mile when I'm doing eighty miles an hour, even when I apply the emergency brake. Unless the engineer figures he has the time and



Top, motorist in a bad spot after failing to note fast train at left. Locomotive at right is standing still. Bottom, Wilson and fireman in locomotive cab

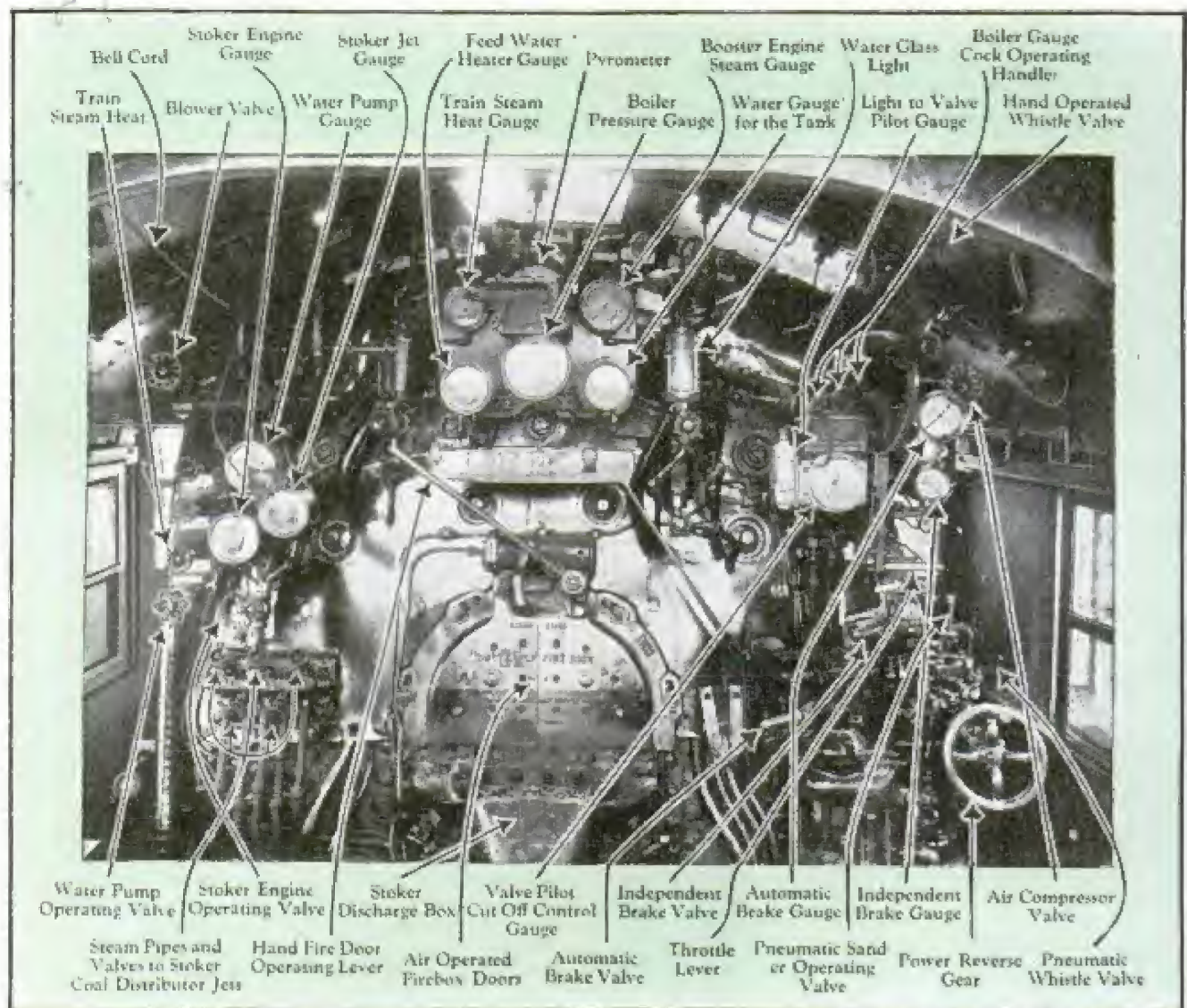
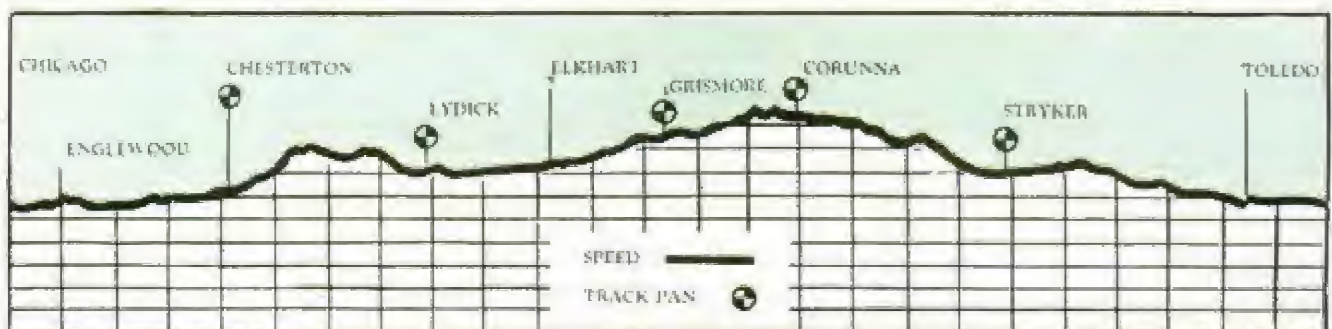


Photo courtesy American Locomotive Co.

stopping distance, and that he will save lives by doing it, application of the emergency brake would be futile. An emergency stop of a heavy passenger train costs the railroad from \$1,200 to \$1,500, depending upon the number of cars in the train. Full application of brakes flattens every wheel on the train, scraping off as much metal as would be worn away in a year's normal service. Added to the loss of that metal is the cost of labor for turning down

each flat wheel in the shops before it can run again. Usually an emergency stop means that the train must be halted right at that point and its passengers, baggage and mail transferred to another train. Regulations forbid operation of a train with flat wheels.

Not so many years ago, the engineer's chief fear was that his locomotive would strike an automobile or a truck, particularly a truck loaded with explosives or in-



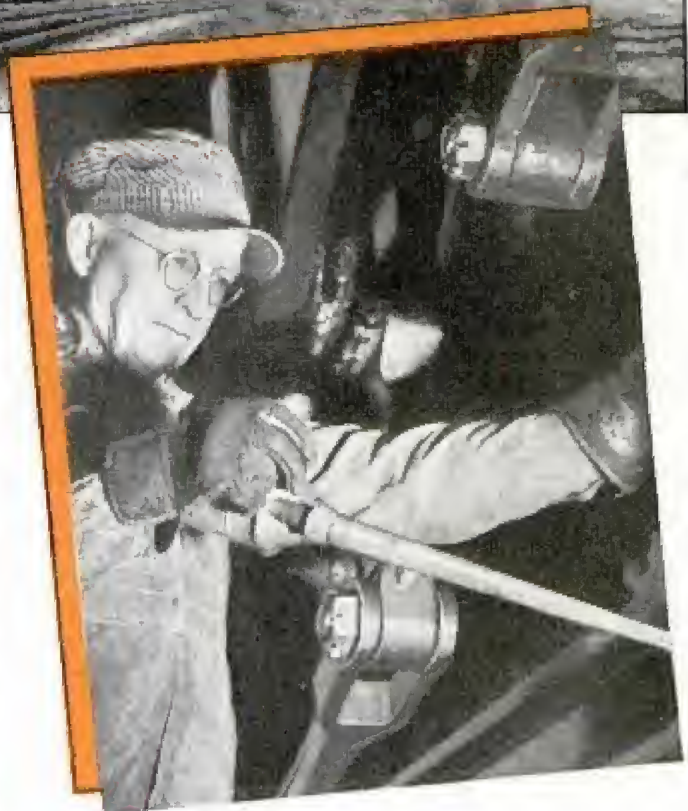
Top, unusual view of Twentieth Century locomotive cab, with essential controls and gauges identified.
Bottom, contour scale drawing of Chicago-Toledo run on the New York Central



flammables. Today, he also dreads the motorist who runs into the side of his train. In the year ending June 30, 1937, forty-eight per cent of the people killed or injured in grade-crossing accidents in New York state received their injuries as a result of vehicles smashing into the sides of trains. The causes of this new problem might be that motorists approach crossings too fast to notice a train is there, particularly at night, and that drivers are careless.

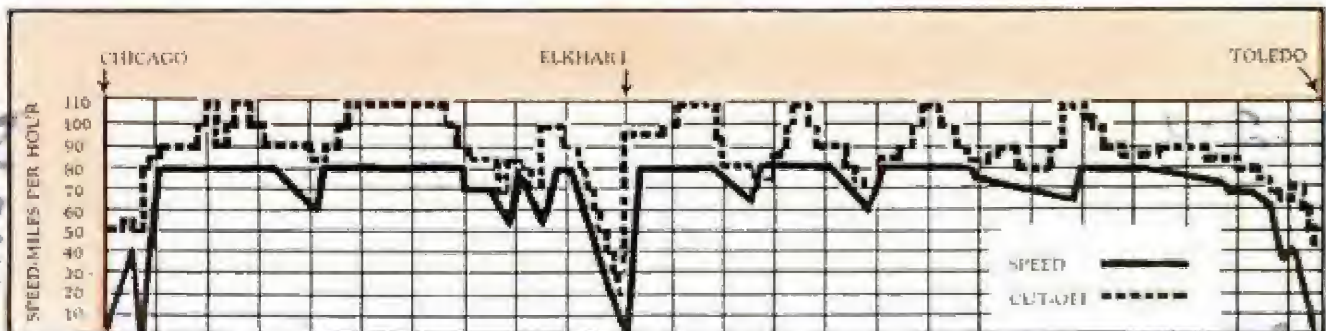
Accidents are being reduced at crossings, through the spending of millions of dollars by the railroads to install under- or overpasses, thus eliminating crossings. But the railroads do not have the financial resources to do this work alone, because there are approximately 235,000 crossings in this country, an average of nearly one per mile of rail line. Approximately 25,000,000 motor vehicles make use of these crossings.

I've been driving an automobile since 1916 and have had only one close call at a crossing. Knowing the danger, I had been teaching my wife to watch for crossing signs. Not long after we left Fort Atkin-



son, Wis., she suddenly said, "Railroad crossing!" I didn't see it, but I slammed on the brakes. Just as I did a big freight locomotive rushed by right in front of me, coming from behind a building at the left. I twisted the wheel and sent the car into the ditch to keep from hitting the train.

(Continued to page 132A)



Top, the "Century" on curve. Center, oiling locomotive. Bottom, sample of speed indicator tape. If the speed and cut-off lines are fairly close together, engine operating efficiency is high.

Hose Car for 'Wash Day' on the Power Line

High-tension lines are kept at the peak of efficiency in Los Angeles by a hose and ladder truck that would make many a fire department envious. On "wash day" the truck moves along the power line, raising the platform atop its seventy-five-foot ladder to the level of the insulators, which are then sprayed clean of corrosion and dust. Its tanks carry 910 gallons of a special cleaning fluid, and a three-cylinder pump throws a stream at 1,000 pounds pressure through a three-quarters-inch hose. On each side of the truck is a container holding 150 feet of high-pressure hose. Rubber tires, rubber pads on the turret floor and pads under the legs which brace the truck on the pavement furnish insulation to protect the crew from shock. A driver and two workmen of the Bureau of Power and Light form the crew. The 27,000-pound truck is forty-seven feet long over-all and has a wheelbase of 222 inches. It has its own suction hoses for quick re-loading and is driven by a 125-horsepower engine.



Above, spraying corrosion and dust from power-line insulators with high-pressure stream of cleaning fluid. Right, with seventy-five-foot turret ladder retracted, the "wash truck" moves on to a new location



Meter Counts Radio Listeners by Recording the Stations Tuned In

To check up for advertisers on the number of listeners on their programs, two automatic meters have been developed. One consists of a clock which unrolls a tape an inch and a half wide while a stylus

writes a record of the stations to which the radio is tuned. As the listener changes to a different station, the stylus moves to a new position. By installing a number of these meters the survey company can ob-

A.C. Nielsen Co 2101 E Howard

331 W 42nd St New York

Business Week
2/26/32

Howard

Truck designed and built by
Crown Body Corp., 3500 S. 12th
Los Angeles, Calif.

2-181

2-240

tain a sample of program popularity. Another system is a multiple-unit recorder which has no tape or stylus attached to the individual radio but transmits to a revolving drum in a central office.

Dripless Server for Mustard Ends "Gooey" Paddles

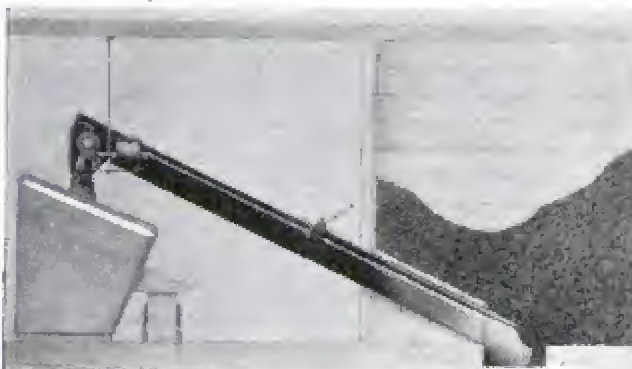


Spurting mustard or other sauces in neat dabs through an opening at the bottom, a dripless server eliminates untidy paddles. The server is filled through the top, and the contents are expelled gradually by pressing or tapping a flexible rubber ejector.

When not in use the dispenser rests in a separate Bakelite base, which makes an airtight seal.

Automatic Loader for Stoker Fills Hopper with Coal

Coal stokers which are fed by a hopper can be made completely automatic by installing a loader that delivers coal from bin to hopper. It has a capacity of ten tons an hour and can be adjusted to fit the requirements of the stoker room. Picking up coal from a trough at the bottom of the bin, it continues loading until the hopper is filled and the motor automatically shuts off. The loader can be suspended from the ceiling or supported on a platform.



Loader delivers coal from bin to hopper of stoker until the latter is filled, then stops automatically

Battery-Run Movie Camera Takes Film Roll Non-Stop



Top, movie-making with the electric camera. Below, inserting a fresh dry battery in place

Driven by a self-contained electric motor instead of the conventional spring, an eight-millimeter movie camera makes it possible to expose an entire twenty-five-foot film roll non-stop. Its standard dry battery, costing twenty cents, will run at least 500 feet of film and leave probably 100 per cent reserve, according to its makers. The back of the camera consists of two sliding compartments, one containing battery and motor, the other the film and its moving mechanism. There are no sprockets, a single spring-loaded claw above the f 2.5 lens aperture moving the film. On the front is a safety catch which either locks the camera in operation or prevents its operation. The camera has but one speed, the normal sixteen frames per second.

Handwritten notes:
Hartford Conn
129 Spruce St.
J 200
J 185
J 55.00
Curtis
Norman Willets Co.
216 W. Washington, Chicago

SEA LIFE *under* GLASS



Left, huge captive porpoise takes a mullet from the diver's hand while large turtle hovers nearby in Florida tank. The porpoise and its baby are the only two of the species in captivity



Above, a 235-pound loggerhead turtle idles lazily over the beautiful coral gardens. The brick and steel tanks, filled with sea water and vegetation, duplicate as nearly as possible actual conditions of normal ocean life

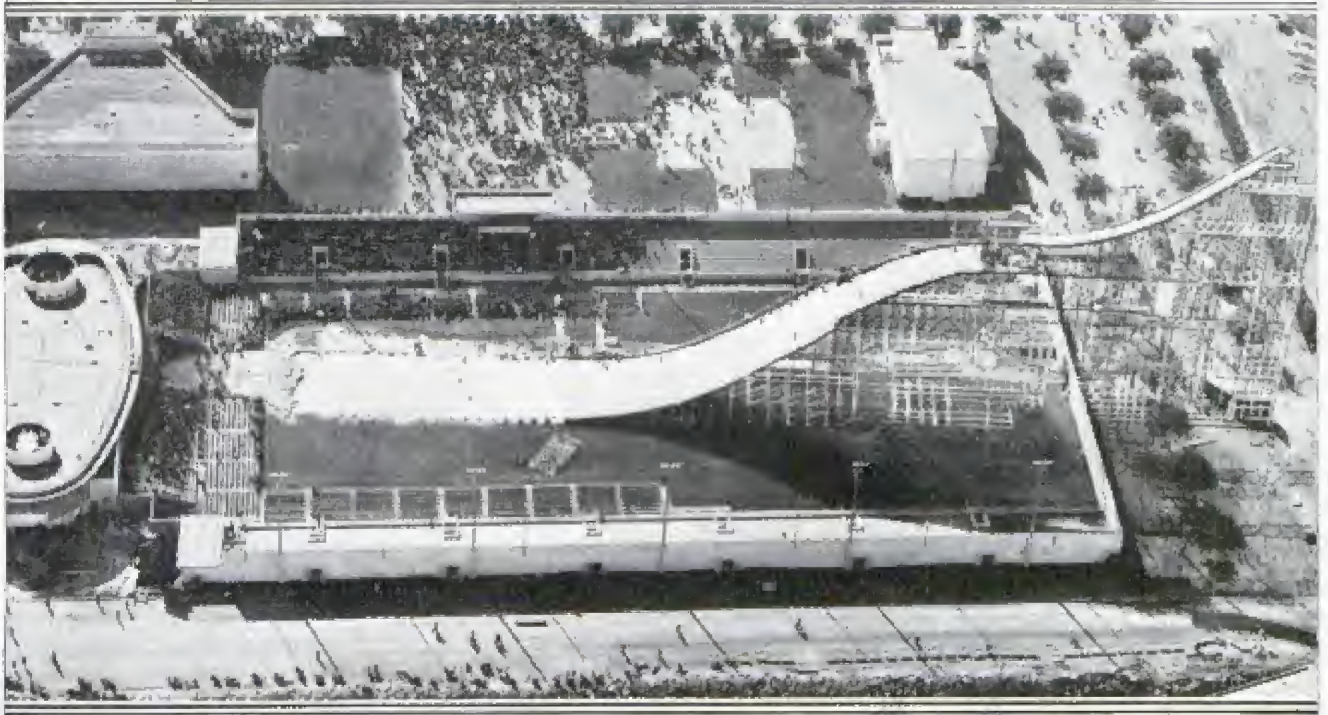


Scene.
Undersea life seen hitherto only by divers can now be watched by visitors to the Marineland aquarium—eighteen miles south of St. Augustine, Fla. At the left is a school of mullets swimming past one of 207 portholes of the aquarium, twelve feet below the surface. They find safety from larger fish in coral garden seen in background



Just in case the eleven-foot, eight-inch ground shark isn't in friendly mood, the diver carries a hammer. The shark, largest known to have been captured alive, was quieted by hypodermic drug before transfer from the specially built fishing boat "Porpoise" to the aquarium

Ski Slide Brings Winter Fun to California Fair



Spectacular ski slide erected on Treasure Island, where topnotch ski jumpers will show their skill to Golden Gate fair visitors. Winter sports will compete side by side with summer games

Treasure Island is the summer playground of the Golden Gate exposition, but that is no bar to winter sports. In fact there will be open season for skiers throughout the fair. A lofty ski slide has

been built on the exposition grounds and champion ski jumpers will take off for the entertainment of exposition visitors, vying for interest with the open-air swimming show not many yards away.

Rainproof Top of Duck Blind Drops When Gun Is Lifted

Rainy days are no hardship for a Salt Lake City duck hunter who has built himself a blind with "buggy top" rainproof canopy that disappears instantly when he lifts his gun to shoot. The entire blind can

be installed in a boat in a few minutes. Its exterior is a rectangular framework two feet high, the sides fitting together with dowel pins. Inside is a cushioned chair, underneath which there is a case of drawers to store ammunition, boots and supplies. The

stock of the shotgun rests in a slot at the right of the seat, holding a catch in place; when the gun is raised for action, the lock is released and the folding top drops out of the way. Paint on the top and reeds inserted in slots along the side makes the blind look like a muskrat house.



Left, gunstock rests in slot locking rainproof canopy over hunter as he waits in blind. Right, top drops automatically when he rises to shoot

■ The life expectancy of passenger autos has increased from 7.04 years in 1924 to 8.58 years in 1938.

George Mueller
1486 Buchanan Wm.

Auto Industries
2/25/39

'Fish Tail' Drives Boat at Ten Miles an Hour



Top, "pumping" the propeller-rudder unit; waves in wake of canoe show it can attain unusual speed. Lower pictures show construction of "mackerel tail" fin of laminated silk set in frame

Borrowing ideas from the swimming methods of fish and the flying technique of birds, a Californian has invented a combination rudder-propeller that drives a canoe through the water at ten miles an hour or better. It is a "half mackerel tail" made of laminated silk set in a frame. When power is applied and the gear set to vibrating, water is trapped in a pocket. Its release as the fin vibrates creates a strong forward motion. The inventor has installed this device on electric-driven toy boats and on a model airplane suspended by a string. On boats, the fin sucks water in from the tip rather than throwing it out, and as it vibrates there is a continuous flowing stream on both sides.

Super-Pure Metal Guarded to Prevent Corrosion

Metallurgists attempting to produce pure metals have developed lead that is 99.9999 per cent fine. Here, as in other phases of human progress, a mysterious resistance against perfection is met. The closer metals approach final purity the more susceptible to corrosion they become, and extreme care must be exercised in the preparation of what are termed super-pure metals. Handling samples without tweezers is avoided, and problems of storage constantly call for solution. Transparent wrappings must be examined to prevent contamination. It is not necessary to start the production of super-pure metals from refined commercial grades, since it has been found that when a major impurity is precipitated out many other impurities go with it. At present aluminum, antimony, bismuth, cadmium, copper, iron, magnesium, nickel, silver, tin, gold, carbon and platinum of high purity, besides lead, are available in moderate quantities.

Land, Arthur D. Till Jr.
2657 Cochrane Ave
Los Angeles, Calif.

g-241
Super-Pure Metal Guarded to Prevent Corrosion
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Reported in Bulletin of Arthur D. Till Jr.
30 Charles River Road, Cambridge, Mass.
Science Service



LILLIPUT Outgrows GULLIVER



THIS picture might illustrate the tale of the seven-league boots. Actually, it's only a man stepping across a diorama depicting a beach scene.

New York

657



THESE were average size dioramas a year or two ago, but today thirty and fifty-foot ones are not uncommon and one is 170 feet long.

By EDWARD HECKLER BURDICK

Industrial Exhibit Designer

WHEN Swift wrote his famous story of Gulliver's travels among the tiny folk of Lilliput, he added a final, startling note of surprise by sending his hero into the land of Brobdingnag, where a race of giants had sprung up.

No less surprising has been the gigantic growth of a new American industrial development, the manufacture of the diorama, during the past year.

Since the dawn of history, the diorama has been a miniature representation of a scene made lifelike by clever application of foreshortened perspective and realism. Down through the centuries, it has remained a miniature.

Within the past few months, dioramas have been completed that extend a whole city block in length. Diorama buildings that have often been fashioned three-

sixteenths of an inch in height now have suddenly mushroomed into three-story structures. Whole cities, patterned from the real and inspired by the imagination, are being reproduced in true scale, or with the effect of true scale. Big, as dioramas go, they still are tiny when compared to actual cities.

Thus, at last, the diorama has outstripped its maker in size.

Diorama craftsmen, trained to do meticulously fine work on trees an eighth of an inch tall, today are climbing thirty-five foot scaffolds carrying out specifications from architectural blueprints. Exactly the same thing has happened to the diorama business as a whole. Eighteen months ago, there was one American corporation specializing in dioramas. Today there are twenty-five. The field, of course, has been made

Diorama Corporation of America, 27-01 Bridge Plaza, North, Long Island City, N.Y.



12/48
fertile by the demands of hundreds of exhibitors in two great fairs. Few exhibits lack dioramas, or one of its less artistic relatives masquerading under the name.

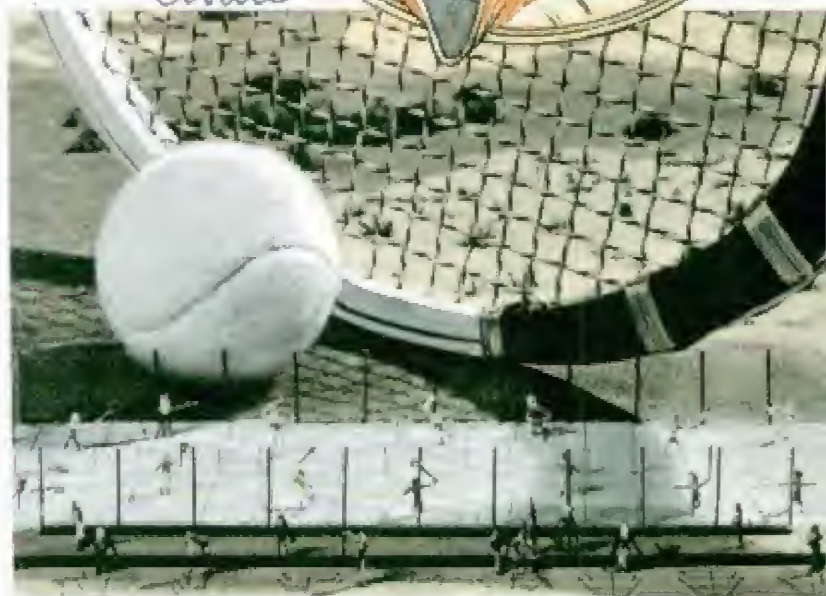
With the passing of the special condition which made Brobdingnagian dioramas desirable for huge exposition displays, the size of the product will simmer down to the proportions normally expected of a miniature. Diorama manufacture then will be established as a big business of making little things.

Since a world's fair is essentially an advertising medium, and since these fairs have caused a tremendous demand for dioramas, it is easy to understand that the diorama is likely to become an important factor in advertising, not in competition with published advertisement, or the radio, but in all fields where three dimensions are especially suitable.

Some of these future uses for dioramas which the present generation will live to see developed are as traveling exhibits, for industrial museums, permanent world's fairs.

654
PART of huge diorama depicting a city of the future. It will be 160 feet in diameter and contain more than 1,000 buildings. Below, ball and racket beside tennis-court diorama.

New York Recreation Centre





660
EDWARD HECKLER
BURDICK, author of this
article and president of
the Diorama Corpora-
tion of America, beside
buildings which form
part of miniature dio-
rama of the Island of
Manhattan and near-by
territory.

FIGURES in diorama
below are made of wire
and solder. The sun-
shades are upholstery
tacks, the grass is
ground cork, the hedges
are rubber sponge and
the foliage is fireproofed
moss from the Florida
Everglades.

*Long Island
Amusement
Center*

trade expositions and outdoor adver-
tising. A greater percentage of the
dioramas of the future will be activated
by moving figures and lighting effects.

Introduced from Europe for the
Century of Progress exposition in
Chicago, the use of the diorama has
increased and the size of the products
themselves has expanded until today
America has brought this art into full
blossom.

We have produced dioramas show-
ing the making of a long line of prod-
ucts from dog biscuits to steel; from
a garden scene in Japan to the water-
front of Louisville; from the digging
of asphalt in Trinidad to the digging
of sillimanite in California; from
jungle life in Brazil to jungle life in
Manhattan; from an industrial plant
in Detroit of today to a small room
where the first cash register was
made; from a street scene in the gay
nineties to an unbuilt dream city of





THIS tiny ball park, modern even to equipment for night lighting, is an accurate miniature of a free ball park maintained by New York City.

some distant day in the future.

This wide range of dramatic possibilities indicates that public acceptance of the diorama is not a temporary fad. Rather that it is pitched on as high a scale of artistic realism as any other contemporary form of art. Indeed, the diorama appeals strongly to two of mankind's most powerful senses, sight and hearing, as no other form of display can, because, aside from being cast in nature's own three dimensions, the modern diorama also usually is animated and enhanced by lighting and sound effects.

An example is the fact that by the use of mechanism one entirely automatic exhibit may show as many as eight dioramas in series, telling a complete story in a natural manner. An ordinary light switch sets it into motion.

The natural manner of presentation

should be stressed because a correctly made diorama causes the person viewing it to project himself into the scene just as a member of a stage or movie audience projects himself into the plot if it is a plausible one.

The dome-shaped case which corresponds to nature's sky, is an American development. The increased size, the discovery of fast colors, the lightweight methods of construction and the incredible permanency of the finished product all have been discovered during the past seven years that the diorama has been made in America.

The result is that in this comparatively short time the diorama, once an unimportant member of the same family with the cyclorama and the panorama, has now risen above them to become head of the family.

61487

661



148
 Langley
 Field

DIORAMA at left represents what you would see from an airplane one-fourth of mile from buildings and a similar distance from the ground. Below, all the cars were placed in one diorama, the requirements of perspective making it necessary for those in background to be smaller.

662

As an example of the development of the diorama, it is doubtful that fifty Americans knew the meaning of the word in 1932. Certainly 20,000,000 recognize the word—meaning “to see through”—today and it is included in nearly every American dictionary, unfortunately, however, with an incorrect definition in almost every case.

An important reason for the slow development of the art in this country, and one which will cause a rapid decrease in the number of diorama manu-

facturers after their first productions are put to test, is the fact that it is almost impossible to find a sufficient number of skilled men to manufacture lifelike dioramas.

It is a safe wager, for example, that if we were to select the 100 best artists and painters in the world today and substitute them for 100 of the men in our studio the company would go out of business within two months, so intricate and tricky is the method of producing quick and accurate perspective.



This perspective is modified by a shift in both vertical and horizontal values, changed again by convex and concave base surfaces and again by angles of sight and finally by the need for perfect merging of the free-standing modeling section into a sky that curves in its own peculiar manner. It is a fact that a true right angle almost never exists in a properly made diorama, even though the scene may portray the rigid architecture of a group of big city skyscrapers.

Another thing which works hardships on beginners is the fact that ninety-five per cent of the cost of dioramas rests with high-

663

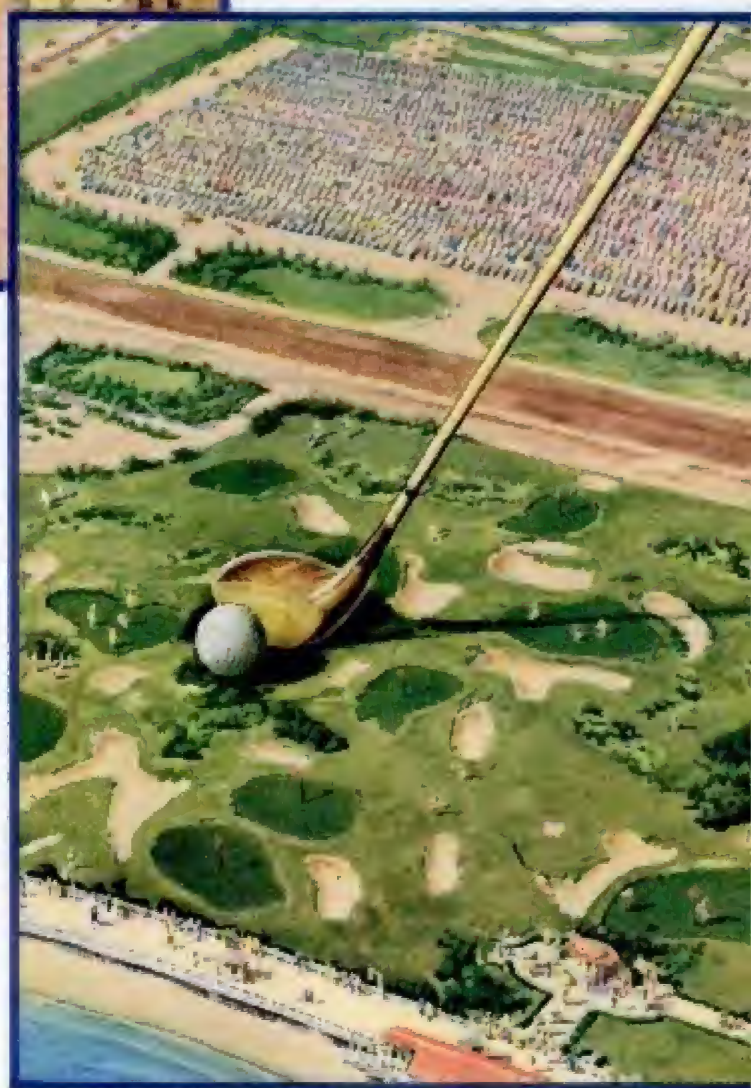


WORKMAN at top is painting in fine details on section of thirty-foot diorama. Bottom, huge dioramas in the making. Ball in background holds sketch in three dimensions of city of the future. At left are buildings to be included in "panorama of New York" diorama.



1487
DIORAMA at left is nearly a city block long and three stories high. It is a colored, lighted, animated model of the New York metropolitan area with 4,000 buildings and 130,000 windows. Below, a golf ball is not very large but it looms like a balloon above the tiny golfers in this diorama of a New York City golf links.

*for Consolidated
 Edison Company
 of New York*

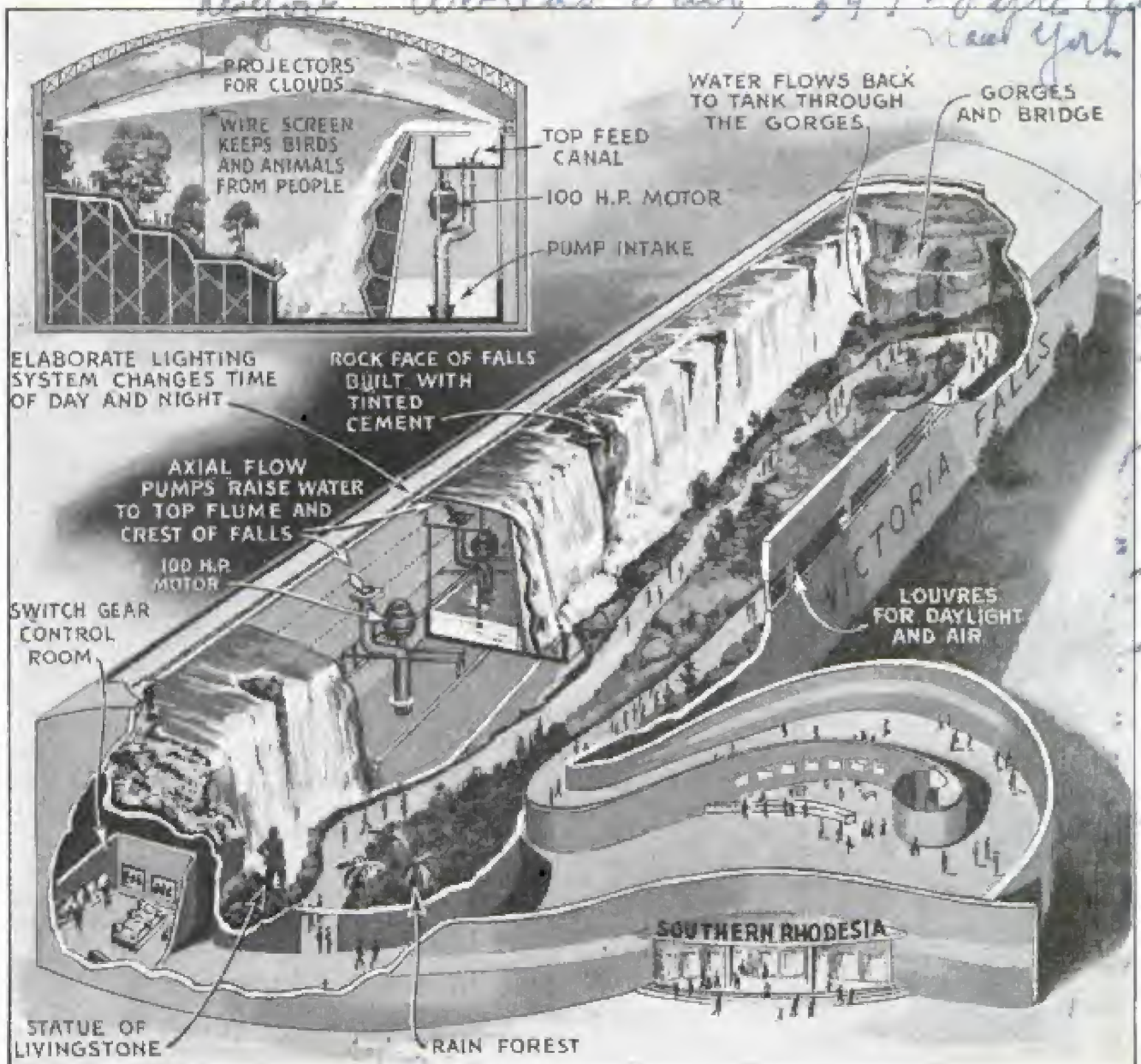


664.
 priced labor, and the correct method of estimating a man's time when he is engaged on an involved artistic problem comes only after years of heart-breaking trial and errors.

Realism and fact, not fancy, are demanded by the public today, which explains the success of a magazine like Popular Mechanics. The public demanded realism on the lighted screen. Moving pictures replaced the stereopticon. Sound was developed; then color. Long ago, magazines and newspapers responded to this demand first with sketches, then photographs, and, more lately, with color.

Now billboards and other out-door advertising facilities are taking a lesson from dioramas and gradually moving into the three-dimensional field and are being activated by lighting effects.

Giant Waterfall Among World Fair Thrillers



VICTORIA Falls, in Southern Rhodesia, will be brought to the New York World's Fair in a model 180 feet long and twenty-two feet high. Sixty thousand gallons of water per minute crashing over the brink into a ravine will give a realistic impression of the falls. Spectators will be able to walk close to the falls and to view jungle animals and birds. At one end of the falls will be a control room for regulation of several 100-horsepower pumps which will maintain the flow of water and of an elaborate lighting system which will permit simulation of day and night through dimming. Water will flow from the ravine into which it falls back to a giant tank through gorges, then be pumped to the crest again. The rock face of the falls will

be built of tinted cement, in the exact coloring of the real falls. Artificial cloud effects will be achieved through the use of projectors on either side of the falls.

2-243

Putty Tool Makes Neat Corners

So simple to use that a novice can do creditable work with it, an inexpensive hand tool for glazing windows is on the market. The putty tool keeps the glass free from surplus material and is especially adapted for making neat corners.



Simple Putty
applicator Co

4835 W 100th Ave
Mankato, Minn

X-Ray Gun on Wheels Finds Faults in Metal



Portable X-ray machine, above, shoots 220,000 volts through three-inch steel plates. Top, left, examining pictures that tell the story, and, below, focusing upon a steel weld



as strong as the surrounding plates will show up somewhat like a white formation of fluffy round clouds unbroken by any of the black marks. The porosity of steel castings makes it impossible to tell from the outside surface whether they are strong internally. Under the bombardment of X-rays, however, a steel casting three inches thick will, in less than a minute, provide an expert with a reliable basis for computing its strength by the pattern of slag holes.

Reflector Inside Photoflood Bulb Focuses Light on Subject

Borrowing an idea from Hollywood where cameras are wheeled about studio lots, engineers of Westinghouse X-ray company have designed and built a portable X-ray camera for detecting concealed weakness in metal. Giant metal parts can be diagnosed by photographs obtained as the jobs move along the production lines of industrial shops. A twenty-inch-long X-ray tube converts 220,000 volts of pulsating direct current into invisible bullets which the 45,000-pound "gun" fires through steel castings and welded seams in the warfare against defective products. If a weld is faulty, X-rays reveal the imperfections as dark spots or "slag holes" on the photographic film; but a weld which is

Photoflood lamps that have their own self-contained reflectors have just been introduced. They offer increased flexibility, since they need only to be screwed into an ordinary socket and the photographer need not carry bulky reflectors with him. The cone of light from the 500-watt lamp covers about sixty degrees and can be used for black and white or color photography.



Westinghouse Electric
3101 Rte. 100, Pottsville, Pa.

21-16 43 rd St. City Hall

Home and Office Combined in Land Yacht



Top, left, luxurious trailer with complete home and office designed by New York advertising man who travels constantly about the country, and, right, radio antennas for short-wave transmitter

Office in forward section, above, is complete with desk, typewriter, dictating machine and filing space. Leather seat on balcony can be made up into double bed, and observation window above enables passengers to look ahead over cab. Right, 1,000-watt radio transmitter, used only for amateur purposes, obtains power from special generator producing 1,750 volts



Left, combination living room, dinette and bedroom, with galley and tile bath beyond, as seen from balcony. Roomy davenport opens into double bed. Entire unit including radio cost more than \$20,000. It is air conditioned and has electric lights throughout. There are beds for six and ample lounging room for ten persons

G. 231 Schell Trailers, Inc.

Elphinstone, Ind.

Chevrolet

Myron Label, President

Lawrence

NEW YORK to EUROPE



PASSENGER carrying airplane service between New York and Europe—long the dream of the aviation industry—is in the process of inauguration by Pan American Airways.

Poised on this side of the Atlantic ocean, ready for the first history-making flight, is an 82,500-pound, all-metal Boeing flying boat—the largest in the world—powered by four great engines and capable of flying 4,275 miles, non-stop, with full load. With a day capacity of seventy-four passengers, the mighty ship is expected to carry forty passengers in luxurious quarters on its maiden journey across the Atlantic. It has a cargo capacity of 5,000 pounds.

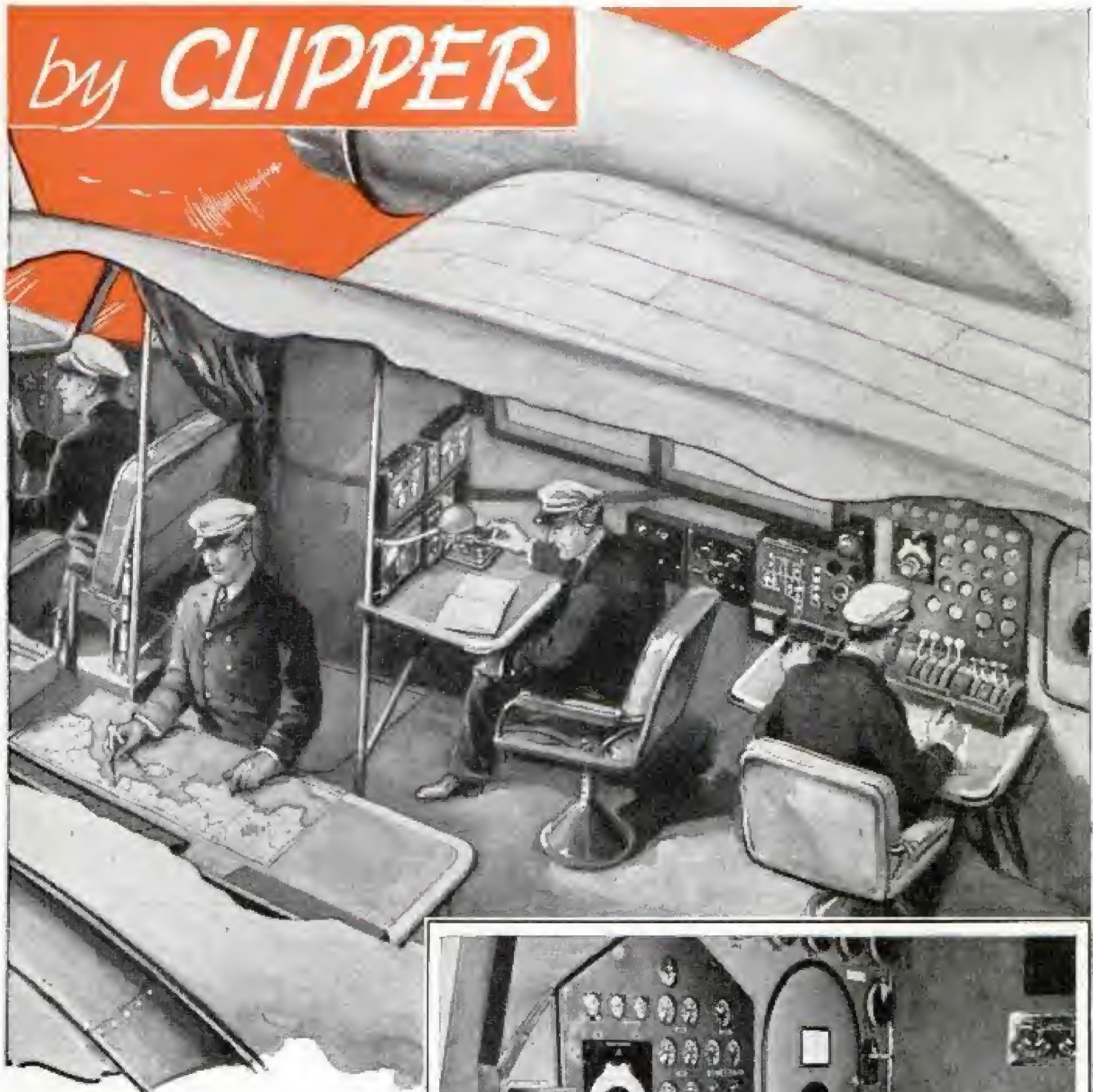
Scarcely will the first clipper roar eastward, within a few weeks, before a second

ocean-going greyhound of the air will be hauled from a hangar at Baltimore, Md., and prepared for the start of the second scheduled voyage. Other sister clippers, now being constructed, will be added to Pan American's Atlantic fleet within a short time, enabling the company to offer service to Europe several times a week.

While the clippers will be serviced at Baltimore, the takeoff terminal will be at North Beach on Long Island sound or at Pan American's temporary base at Port Washington, N. Y. From there a northern

Four 1500-hp
Wright Cyclone engines. I 238

by CLIPPER



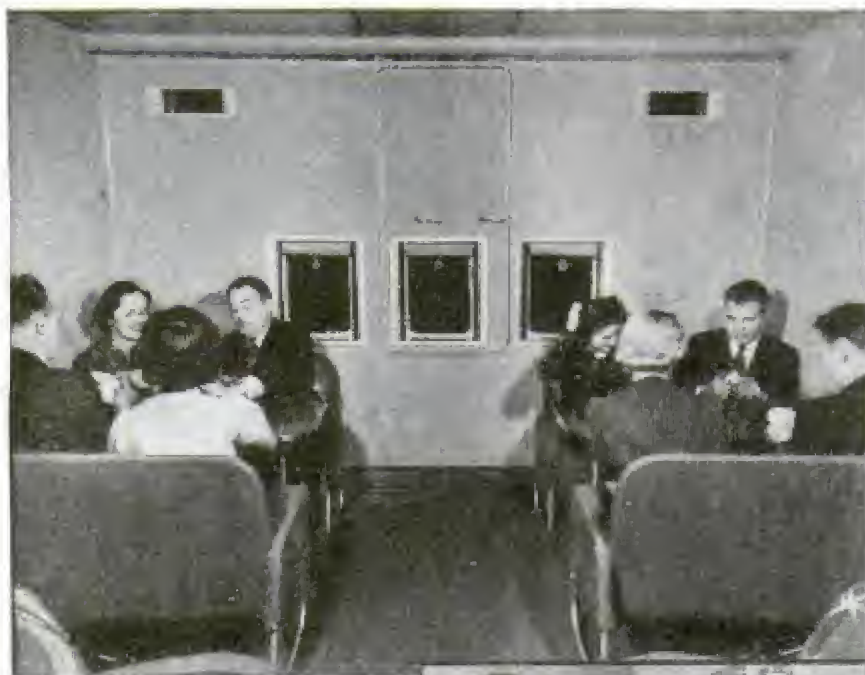
Opposite page (bottom), striking night photo of the Yankee Clipper. On this and opposite page, cutaway sketch of the clipper's flight deck with officers at their posts. The master is not pictured. Right, right engineer at the controls

J. E. Prentiss



route, which will be used during summer, is by Shediac, New Brunswick, to Botwood, Newfoundland, thence across a 1,995-mile overwater jump to Foynes, Ireland, and

finally to Southampton, England. Passengers may reach London by air taxi or train. Flying time will be approximately twenty-four hours, necessitating an overnight



flight for the trip across the open Atlantic; hence capacity of the clippers will be limited to that of night service, forty passengers. Another route, known as the southern, is by way of The Azores and Lisbon, Portugal, to Marseilles, France. Requiring about thirty-six hours, this route is the one the most favored for winter service and is being considered for the maiden flight. Baltimore probably will be the terminal for winter flights.

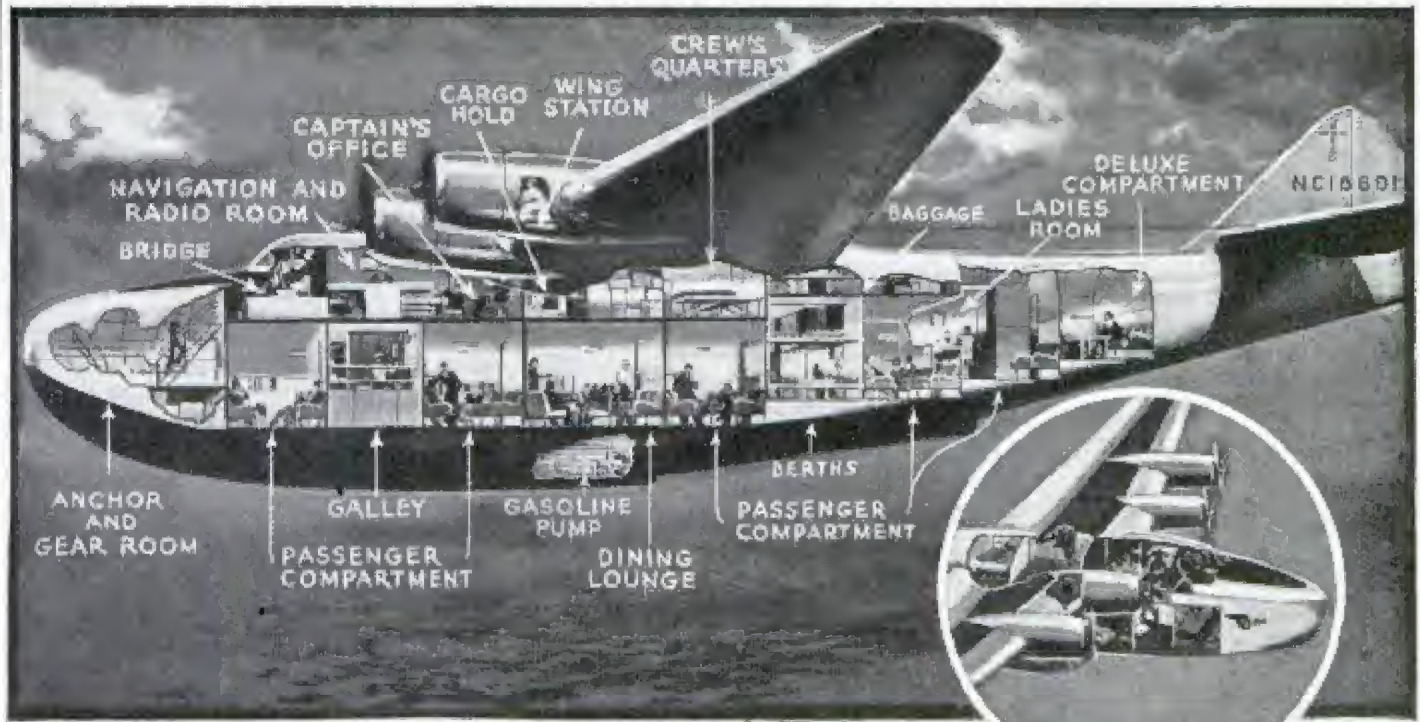
Even persons accustomed to the best in air travel will find clipper accommodations a surprise. With its two decks and eighteen separate rooms, its soft carpeted floors, its davenport-type lounging chairs and its modern styling throughout, the Atlantic air queen is virtually a "Park Avenue suite on wings." You board the ship by gangplank that leads to the broad upper surface of one of the hydro-stabilizers, which is a 1,500-gallon fuel reservoir but serves as a loading deck. Entering the passenger deck by a side door, you step down three steps into the dining saloon and recreation center, the largest room in the ship with the exception of the control room on the upper deck. The ten and one-half by twelve-foot dining room has a gay color scheme, with a spirited blue pattern on furniture uphol-



stery, rich carpeting and walls of silvery beige. Double windows on either side of the room have modern Venetian-type blinds, as do windows of all passenger compartments. There are five dining tables of polished black walnut and deeply upholstered chairs for fifteen persons to be served at a time.

Arched doorways at either end of the central lounge lead to passenger quarters fore and aft. Going aft, you pass through three standard compartments, each with floor dimensions of seven and one-half by twelve feet and a height of seven and one-half feet. Seats are upholstered in beige wool tapestry, tailored with leather trimmings. The cabins are exceptionally quiet, the result of double insulation and sound-proofing in the walls and

Top, dining saloon in use as recreation room. Center, men's room, with electric razor in use. Bottom, berths made up for night flight, such as the clipper will make across the Atlantic

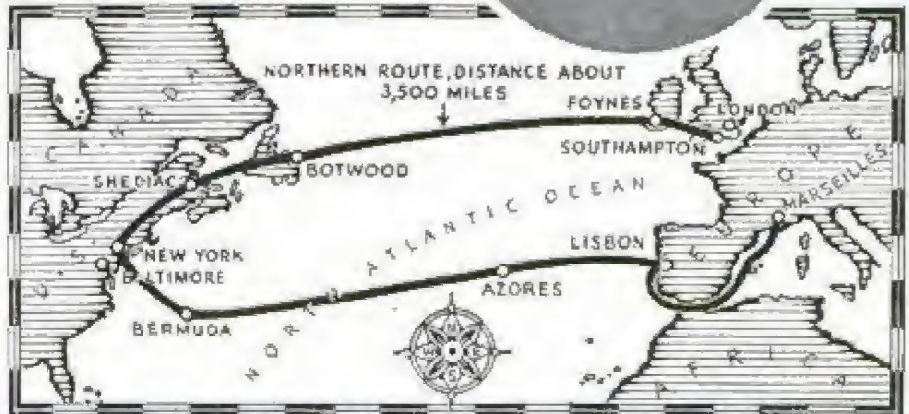


soft carpeting on the floors.

At night two triple seats and two double seats in each compartment will be converted into upper and lower berths all more than six feet long. Each berth has an outside window, individual ventilator, reading light, steward's call button, clothes rack and hangers.

Farther toward the stern you find a four-passenger port side compartment, opposite which is the women's dressing room. Furnishings of this dressing room include leather-covered upholstered dressing table stools, long double dressing table with two plate-glass mirrors and modern lighting fixtures, wash basin with hot and cold running water, another large mirror and a dental lavatory. Finally, in the aft-most section, you enter a de luxe compartment, or "bridal suite." This room contains a love

(Continued to page 151A)



Top, cutaway view of the clipper showing spacious passenger quarters and the flight deck. Inset, motors and control section at front of giant ship. Center, map showing northern and southern routes over which the clipper will fly to Europe. Bottom, one of the ten-passenger compartments made up for day travel

Rustless Steel House Washed Like Automobile



Alloy steel house and two interior views. Center, living room, and, below, kitchen trimmed with rustless steel

Built of little else but alloy steel, a streamline house has a framework of prefabricated, lightweight metal, and the outside walls are sheets of high-grade, corrosion resistant alloy—a new metal that is also used in making many things from jewelry to tank cars and building decorations. Besides being fireproof, it is claimed the structure is proof against termites and warping, tornádoes and earthquakes, heat and cold, as well as noise and creaks. The house may be washed with a garden hose like the family car, and makes a suitable home in any climate from the arctic to the tropics. All the conveniences of an apartment are incorporated, as exemplified by the one built in Youngstown, Ohio, for all of its five rooms are on one floor, and there is no basement. It has two bedrooms, a living room, bathroom, kitchen and dinette, and a utility room containing air-conditioning equipment, gas or oil heater, automatic clothes dryer and laundry tubs. Oak floors are set in mastic cement to prevent warping, and the finish is steamed so it will not scratch or mar. The only other wood is in the doors, all molding and finishing being of steel. Inner walls are of composition material with a four-inch layer of air between, and a six-inch air layer between the roof and ceiling provides insulation. On the flat roof is an attractive sun deck. This type of house is manufactured to sell for \$5,000, which does not include cost of lot.

Radio Lights for Blind Landing Guide Pilot on Straight Glide Path

Radio waves only seventeen inches long "light up" a straight glide path for airplanes in a blind landing system that has been tested successfully at East Boston airport. The spotlight beam of the shortest waves ever used in aeronautical radio activates three lighted dots in a cathode-ray tube on the dashboard of the plane. When

the three lights are lined up horizontally, with the middle dot centered, the plane is on course, and at all times during the glide it is in proper landing position. The center light is controlled by four overlapping radio beams, and if the plane rises or falls or moves to right or left of the path the light will vary from true center.

Developed by Mass. Institute of Technology
Cambridge, Mass. and U.S. Navy Dept. of the Interior

g 218
Booth - Reese Realty Co.
Leolan Bank Bldg.
Youngstown, Ohio
g 267
3/1/39
Gives almost any building
Washington, D.C.

Riderless "Bike" Is Balanced by Electric Eye

Ready for a hundred-thousand-mile riderless run that starts at the New York world's fair in May is a bicycle that balances itself with the help of a photoelectric cell. In a test run at the Westinghouse laboratories it clipped off twenty-eight miles an hour, and it is expected to pace off nearly 400 miles a day for 365 days at New York. There are no supporting wires or braces. The bicycle coasts along on three metal rollers, getting nowhere rapidly, of course, but demonstrating that it can stay erect and straight without human hands to steer it. It can even take a three-pound side push against its saddle before losing its balance. The electric "eye" is focused on a mirror under the pedals, which reflects varying amounts of light as the bicycle tilts from true upright position. As the tilting varies the light, a motor steers the front wheel and moves two weights, attached to the front mudguard and over the front wheel, to balance the bicycle. A similar method is used by the U. S. Army to



Weights over front wheel and behind front mudguard help balance bicycle. Electric eye is focused on mirror under pedals

direct giant searchlights by remote control. An observer standing outside the glare of the big light sights an object through binoculars mounted on a movable arm, and every movement of the binoculars sends an electric impulse to a regulating motor which actuates balancers to direct the beam of the searchlight.

Safety Chock for Auto Trailer Prevents Backslide on Hill

Immediate protection in any emergency stop on a hill is provided by a safety chock that fits between the wheels of a trailer,



Safety chock in first position, and, below, in final position with truck wheels lifted off pavement

preventing it from sliding back downhill. It acts independently of the brakes, and is instantly operated from the driver's cab. When released, the chock drops to the pavement and braces the trailer. Should momentum carry the trailer farther back, the chock would ride over to its second or third cleats, doubling its own holding surface on the road and finally lifting the trailer wheels clear of the road.

Contact Prints in Natural Color Made on Sensitive Paper

Amateur photographers can make natural-color prints with a color-sensitive paper which does not require the use of separate negatives for each primary color. The print is made direct from the original full-color film. For contact printing, an exposure of twenty to twenty-five minutes by the light of a photoflood lamp held a foot away is recommended.

Vitachrome Film Corp
1000 Columbus Ave
New York 17, N.Y.

Automobile Co
7801 Madison Ave
New York 17, N.Y.

paper \$2.00 per 100 sheets up
for above. \$5 cents up

SECRETS of a

By Monte Pearson

Member of the Yankees Pitching Staff

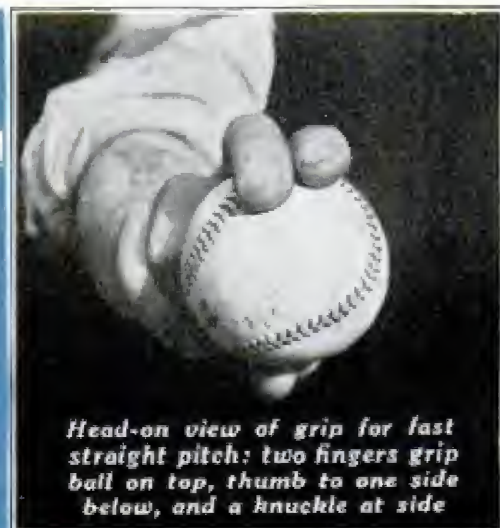
2020 Clay A. Green, 2nd

BIG-LEAGUE baseball is a slugger's game today. The smooth and lively ball that we use hardly permits a pitcher to throw anything except a fast, straight delivery that the batter can sock out of the park.

That's the secret of the big scores. That's the reason for the numerous batting sprees and that's why no-hit games are only half as common as they were five or six years ago. The public likes it but the pitchers don't.

When you toss in a ball that's as slick as glass and has stitching so smooth that you have to feel for the threads twice, you reduce the pitcher's ability to throw deceptive curves. He can't grip the ball firmly enough to impart the spin that he wants and he can't even get the grip on the stitches. It's true that after an inning the ball becomes easier to hold, but just about

Position of fingers around ball indicates pitcher above is winding up for fast straight throw, although change of wrist position might still produce a curve ball



*2/15 Contributor: Norman B. ...
10555 Solman Ave.
Los Angeles, Calif.*

CHAMPION PITCHER



Crack! A big league batsman has just connected with a fast one and the bat is still swinging

that time the batter is apt to complain that the ball has been roughened by use and call for a new one.

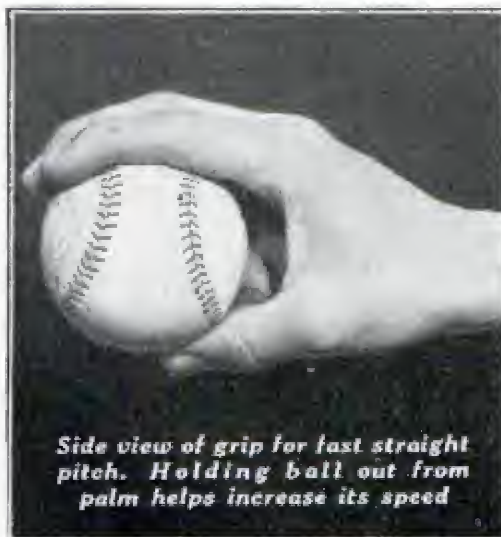
The result is that the art of pitching has been transformed. The straight fast ball, the change of pace, and a curve or two when the condition of the ball permits make up a pitcher's repertoire in that order of importance. In the world series game

that I pitched last fall I don't think I threw more than half a dozen curves. But curves are important and whenever you have a ball that's rough enough to grip you can throw good ones.

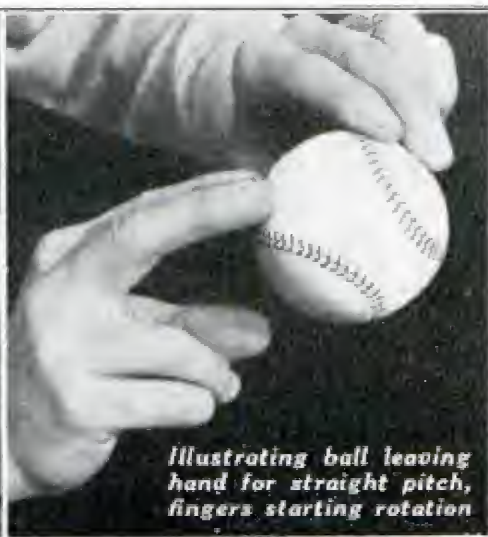
First, let's take up the straight pitch. Hold the ball at three points, the parallel forefinger and middle finger gripping it above, the thumb below to the left, and the

knuckle of the ring finger below to the right. Don't smother the ball close to the palm. Hold it more by the finger tips so that it is as much as an inch away from the palm. Grip it tightly, letting it fly out from under the forefinger and middle finger at the end of the throw. Those two fingers, being above it, impart reverse English to the ball in flight, making it rotate upward.

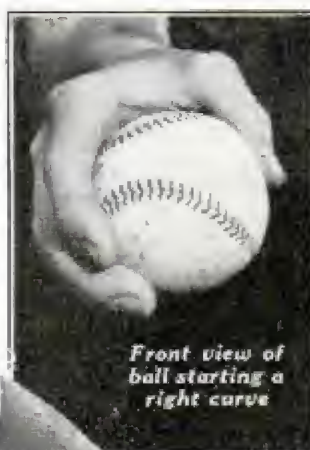
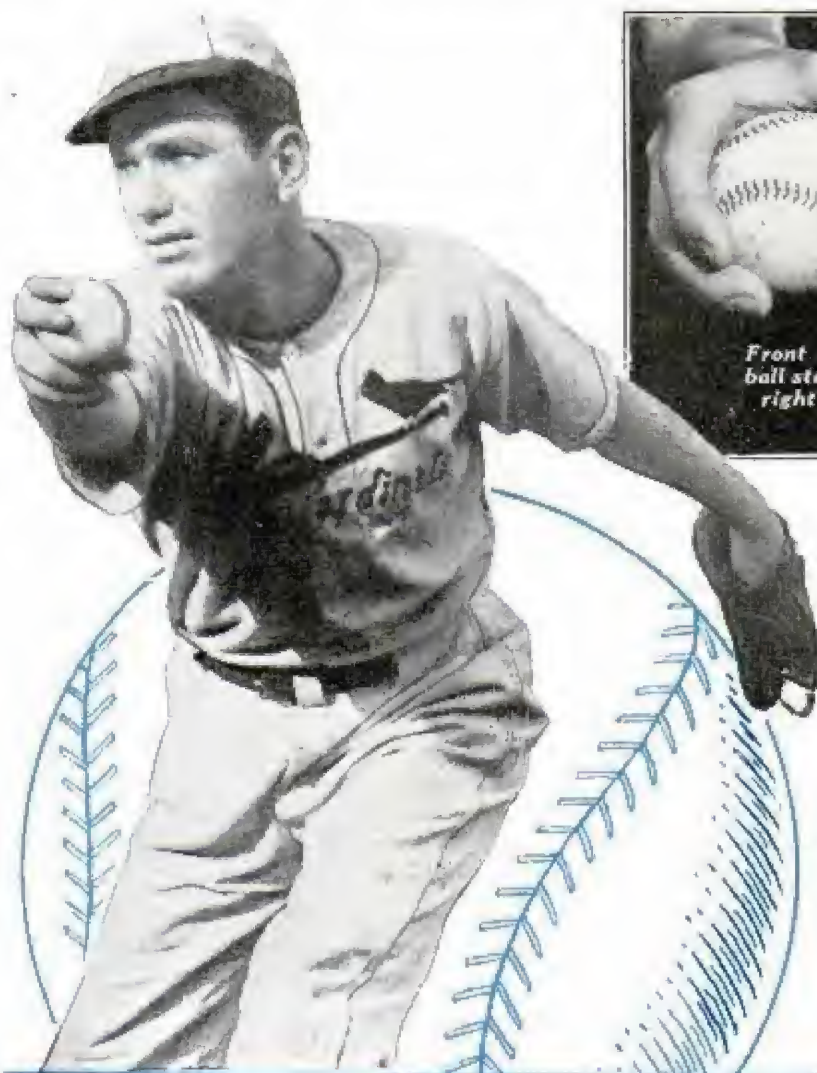
As far as I can make out,



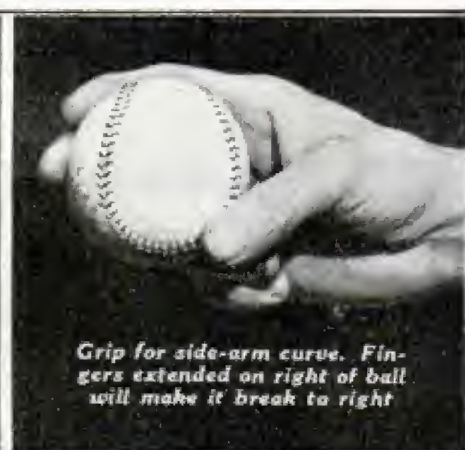
Side view of grip for fast straight pitch. Holding ball out from palm helps increase its speed



Illustrating ball leaving hand for straight pitch, fingers starting rotation



Front view of ball starting a right curve



Grip for side-arm curve. Fingers extended on right of ball will make it break to right

At left, pitcher is seen at the moment of releasing ball that will curve to right

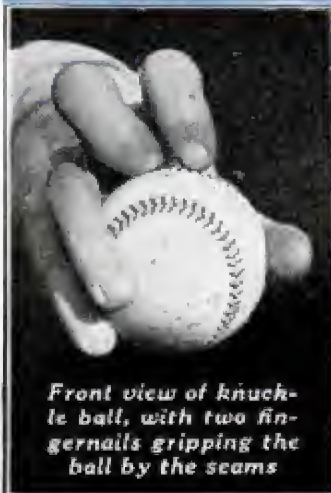
a really fast ball is something some people can throw and others can't. Nearly any green pitcher can learn to throw a curve but there isn't much to learn to help you throw faster than your normal speed. A fast pitcher has a ball that acts lively. It tends to rise as it nears the plate.

The more you spin it the more it tends to rise. It's really an upward curve with gravity fighting to keep it from breaking too much. A baseball will curve in the direction of its own rotation. Throw it with reverse English and it tends to go up. Spin it like a wheel and it will drop. The reason for this is the difference in pressure on opposite sides of the ball.

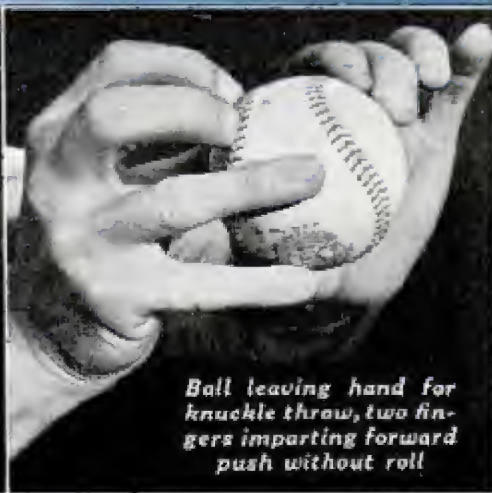
A rotating ball carries a thin layer of air with it. This layer of air is sticky and it moves with the surface of the ball. Suppose you make a pitch and spin the ball so that it rotates from right to left. At the left side of the ball the layer of air is rotating away from the head wind. On the right side the layer of air is moving forward, meeting the head wind. The density of the air is increased at the right side, and decreased at the left. Obviously the path of the ball is going to curve toward the side



With two "control" fingers under ball and thumb behind it, pitcher can impart a rolling motion indicated by dotted line. This makes the ball curve downward or break into a drop at the plate



Front view of knuckle ball, with two fingernails gripping the ball by the seams



Ball leaving hand for knuckle throw, two fingers imparting forward push without roll



Ball thrown in direction indicated by right arrow, and rotating to right, meets heavier air pressure on left side than on right and will curve to right

Monte Pearson of the Yankees pitching to a Cleveland batter. One day last summer when he didn't feel like pitching Pearson shut out Cleveland without a hit



of least pressure. Greater pressure at the right forces the ball to the left.

Theoretically a spinning ball should start a gentle curve as soon as it leaves your hand. The faster you throw a ball, the farther it will travel in a straight line before beginning to curve. When such a ball does start to curve it "breaks" rapidly. That's important because you can throw a fast curve straight at the plate and the ball travels in a straight line until only a foot or so in front of the batter. Then it breaks in the direction you want it to.

Now that you understand why a curved ball acts the way it does, it will be easier to try to throw one. Your extended parallel forefinger and middle finger plus wrist action are what make

the ball spin, so you will get the direction of curve that you want simply by the way you hold your hand at the end of the pitch. The ball will tend to break in the direction of your two fingers.

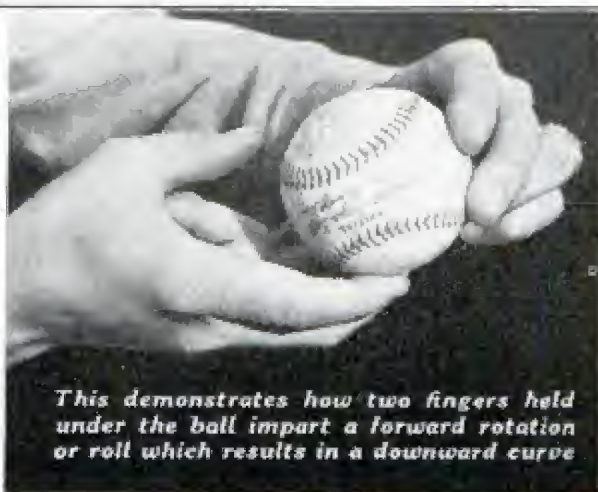
To throw a drop curve start out just as if throwing a fast straight ball, but at the end of the pitch twist the wrist out and down, releasing the ball so that it travels over the forefinger. That makes it spin as if it were rolling along the ground and assures a drop.

For a right curve, hold your wrist so that the

(Continued to page 144A)



Wrist is thrown out and down for fast drop, just being released here



This demonstrates how two fingers held under the ball impart a forward rotation or roll which results in a downward curve

Stencil Lamp on Cafe Wall Depicts Item on Menu



Oriental boat with fisherman casting net, stenciled in brass wall lamp, symbolize fish in museum cafe

Steaks and chops, cereals and other items on the bill of fare are dramatized in stenciled lamps on the wall of the public dining room at the Rosenwald Museum of Science and Industry at Chicago. The designs were sketched on paper by artists on the museum staff, then transferred to brass and cut out. Steaks are represented by a cut-out cowboy lassoing steers, with a cattle train for a top border and frying pans beneath. Other lamps depict cereal grains, vegetables and the chef in his kitchen.

Floating-Ride Seat Adjustable to Road and Driver



Featuring an adjustable hydraulic control by means of which seat movement may be timed to suit speed, road conditions and weight of the driver, a new seat for trucks

has been introduced. The front surface of the back moves in unison with the top surface of the seat, doing away with jolts and jars, and affording a floating ride said to be even more comfortable than that enjoyed by the passenger car driver. The back is shaped to support the occupant in comfortable posture, a thing impossible with the conventional type of seat where the driver's back is in constant up-and-down motion with relation to the seat back.

"Ear" Regulates Mill Feeder to Tone of Grinder Noise

Making the roar of a grinding mill regulate the flow of material into the mill, a microphone and electrical circuit operating the control is actuated by the sound it "hears." Too much noise is a signal to feed minerals more rapidly into the crusher, but if the mill is running too silently the electric ear senses that it is feeding too fast and shuts down the intake. Thus the highest efficiency is obtained by providing exactly the right amount of material.

Steel Loop Gives Noisy Warning When Car Is Close to Curb



Inset shows steel coil which, attached to running board, gives rasping warning when car is near curb

Two small steel coils attached to the running board of your car will save the fenders from many a dent and scratch in parking. The "curb finders" extend about two inches from the side of the automobile and sound a noisy warning note when they touch the curb. They are easy to install.

Car & Hotel Products
Box 30 Royal Oak

J-159
Lux 832.50
1000
Standard 828.50

York Pa
J-193
J-101
Crandall
Protective Products, 4444 Sunset Blvd
Los Angeles

Spring Balances Floating Lamp at Any Angle

Right, the "floating" lamps used as reflectors for home photography. Below, installed in pit to illuminate greasing work on car, and lighting a workbench. Coil spring which balances lamp in any position without thumbscrew or other adjustments is in the lower elbow



Responding to a fingertip touch, a "floating" lamp just introduced will assume any position and hold it without any tightening of thumbscrews or other adjustment. An ingenious coil spring balances the double arms of the lamp and produces the "floating" effect. One hand can make any horizontal or vertical adjustment of position; a double swivel at the lamp socket and a full-circle pivot at the base render it highly flexible and convenient for use over the card table or hospital bed, in the workshop or greasing pit, the photographer's dark-room or studio, the physician's and dentist's office, or as a study lamp. There are various models with pedestals, brackets or clamps for attachment to work desks. Because of the facility of adjustment and steadiness of the lamp it is an easy matter to focus light exactly where needed without reflecting glare into the eyes.

Magnetic Wind That Blows Out Lightning Flash Protects Power Lines

Acting as quick as electricity, a blast of magnetic wind, developed by Westinghouse engineers, blows out a flash of man-made lightning. The lightning flash, occurring on high-voltage power lines when a circuit breaker opens, leaps in a hot arc

across the gap between open ends of the circuit and makes a noise like thunder, sometimes filling a workroom with fumes. A puff of the magnetic wind reduces this to a wisp of flame, "muffles" the thunder to a puny bang and permits no great odor.

Dr. Ludwig and Dr. S. S. Lussinger

6/24/29

Marion. Collier. Scranton. Pa



LISTENING IN on

485 Madison Ave New York

YOU are probably an American at work in one of the 22,000 basic occupations in the United States. Very likely you do your job every day without finding much that's unusual about it.

"Americans at Work," the Columbia Broadcasting System's weekly survey of the country's jobs, brings to the listening audience the story of working America—both the history and background of such outstanding industries as mining, steel work, baking, railroad engineering, dynamiting, bricklaying, bus driving. It also brings to the microphone each week actual workmen in each one of these industries—workmen who know their jobs and can tell people just how they mine or lay bricks or put up skyscrapers or drive steam engines.

Since its beginning in April, 1938, it has brought more than forty occupations to the microphone.

A steel worker on the Tower of the Sun in San Francisco told listening America about the time a "heater" threw him a hot



Top, radio staff gets interview from miners 700 feet underground. Bottom, boarding bus to get driver's story on the air

Cross country
Ken Ellinger
P.B. Suranace



AMERICA *at* WORK

rivet when he wasn't looking.

"I had to do some tall dancing on that girder—I say I did!" said the steel worker reminisciently into the mike while listeners gasped—and looked with greater understanding and interest next time they passed a tall building under construction and saw the specks of men nonchalantly catching hot rivets and putting them expertly into place forty or fifty floors above the street.

A longshoreman, working on the United States Lines ship, "George Washington," talked about the time he and his partner fell into water in the hold of a ship they were unloading—and had the unusual experience of being forced to swim on the inside of a boat instead of the outside.

The Americans at work on "Americans

Left, interviewing express handler on his tractor. Right, down the pole slides Fireman Walter Brown while CBS Announcer Alan Scott watches

Houseman

at Work" also have brand new experiences. The industry chosen for the first broadcast was the mole-like one of digging America's tunnels—the work of the sandhog. In order to talk to the sandhogs, CBS announcer Bob Trout, and technicians Bob Trago, Frank Evans, and James Kenny had to penetrate nearly a hundred feet underground where real sandhogs were digging at New York's new Six Avenue subway.

Before any of them were allowed to go underground, they had to have complete physical examinations, with special atten-



Top, keeping the mike dry during broadcast from deck of liner. Left, dynamiter preparing to set off blast before going on air

tion to their heart action. Sandhogs work under greatly increased air pressure, and it is extremely dangerous to enter the region where they are digging unless you take the same precautions they take.

This means approaching them through a special air compression chamber which is a huge airtight cylinder, about twenty feet long and six feet high. In this chamber,

the air pressure is gradually increased from normal to nearly thirty-five pounds per square inch.

To the CBS staff, this experience became a little fantastic when all of them were provided with the special badges worn by all sandhogs as a protection against the "bends," an after-effect which sometimes takes place as a result of too-quick passage through the air compression chamber.

The badges tell strangers that if the wearer suddenly becomes paralyzed or staggers peculiarly, he probably has the "bends" and is to be taken to the special hospital of the subway construction company for treatment.

Not only did the technicians themselves have to be put through the compression chamber for this broadcast, but so did their telephone lines. Holes had to be drilled through the air chamber, with especial care not to admit the slightest breath of air, in order to get the lines to the scene of the broadcast. Then, after it was all over, the holes had to be just as carefully plugged up again.

Such problems as passing lines through an air compression chamber quickly became routine for the CBS technicians. Each time they packed up their suitcases full of remote equipment and set out for

Washington

the Port

some hospital, coal mine, automobile factory, bakery, airport, or railway terminal, they knew there would be problems to meet. But just what these problems would be were never discovered till they were on the job.

Take the second time they went underground with microphones and amplifiers to the site of the new subway where the dynamiters were at work.

Mikes were set up on a platform about fifty feet from where an actual blast was expected to take place. When the equipment was set up, the chief blaster decided the mike was not close enough to catch the full effect of the sound to go out over the air.

This was a real problem for technician Kenny, as there seemed to be no place to hang a mike any closer. Finally, he discovered a narrow girder about fifty feet high and climbed along that to hang a mike directly over the spot where the blast would occur.

And, after all that trouble, the mike was of no use anyhow.



Mel Allen



*Woman in background
CBS telegraph*



Top, getting 'phone operators' story. Circle, veteran woman telegraph operator at mike. Bottom, air compression chamber through which radio men passed to get sandhog story

Excavation for New York

When the blast came, it was so terrific that it ruined the microphone, even though Kenny had, as a precaution, turned it off just in time.

Another time Kenny had to crawl along a four-inch string piece above the Hudson river to get at the lines he had to connect to his equipment on board a fishing boat at the Fulton street docks.

One difficulty the program pro-

(Continued to page 141A)

Pipeline Does Hairpin Turn to Allow for Expansion



Natural gas line does "sky loop" to allow expansion and contraction from temperature changes in open

Where it crosses the San Diego river on a trestle, the natural gas pipeline of the San Diego Consolidated Gas and Electric company climbs into the sky for a graceful hairpin turn. Actually this is a "safety valve." Emerging from the ground to cross the river, the line is subject to changes of temperature in the open and some provision had to be made to allow contraction and expansion. This semi-loop acts as a safety spring, rising or flattening with expansion and contraction.

Bell in Radio Receiver Is Rung by Call to Lookout Tower

Emergency radio calls ring the bell of a receiving set developed in the Forest Service radio laboratory at Portland, Ore. Intended for installation in fire lookout towers, ranger and dispatcher stations, the bell can be rung by any ultra-high frequency set—even the lightest eight-pound portable. Signals can be carried to men working outside their stations, if neces-

sary, and when several stations are included in one network a series of code-rings is possible. This bell-ringing system operates at less expense than the usual loudspeaker arrangement, and it keeps a constant twenty-four hour vigil.

Golf Tee Retrieved by Magnet Which Clings to Head of Club

You now can put your golf tee on a leash so it will not dart out of sight when the ball is struck. At the other end of the string is a tiny but powerful magnet made of Alnico, and after teeing off you simply wave the club near the magnet and it will attach itself to the bottom of the steel shaft. The tricky retriever saves hunting for lost tees and you don't even have to stoop.



Locking Tray Built in Drawer Keeps Jewels Safe

Jewelry and valuables are guarded in a locking tray which is built into the drawer of a bureau or dresser. The tray slides from front to back and can be unlocked only with a key or by dialing the correct combination. The interior compartment is lined with tarnish-resisting fabric.



Sliding tray in top of drawer keeps jewels out of sight and can be unlocked with key or combination

Motorized Cowboys Round Up a Buffalo Herd



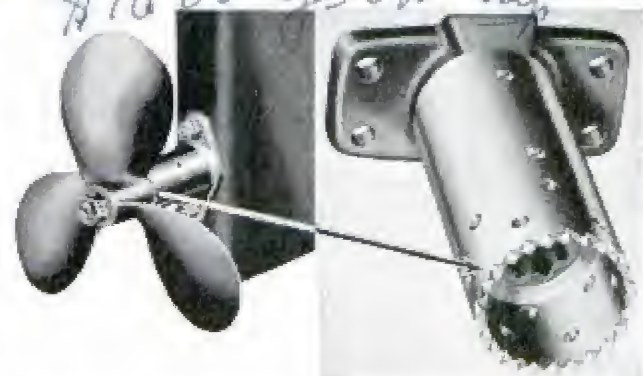
Park rangers in South Dakota's Wind Cave National Park "ride herd" on buffaloes in old "jalopies." Riding the range in a car may be rough, but it's safer, for automobiles command respect from buffaloes

Riding the buffalo range in decade-old automobiles is not like touring the city boulevards in a comfortable sedan, but at that it's safer to chase buffaloes in cars than saddles. So the park rangers at Wind Cave National Park in South Dakota conduct their annual buffalo roundups with mechanical steeds instead of the western

ponies traditionally used. Under the expert handling of the motorized cowboys the old, light cars can get around almost anywhere the buffalo can. They stand the rough terrain well, and buffaloes have more respect for the chugging car than for the pony. The rangers say the roundup in automobiles is faster, safer and more economical.

Sawteeth Guard Boat Propeller from Fouling on Ropes

To protect a boat's propeller shaft and bearings from damage by fouled ropes, a sawtooth sleeve has been developed. Fitting over the exposed shaft, it prevents a rope from wrapping tight around it, and the sawteeth quickly "chew" off the obstruction. Perforations along the sleeve permit the bearings to "breathe" even when the protector is momentarily fouled.



Sawteeth on sleeve of propeller shaft quickly cut through ropes or weeds and prevent fouling propeller

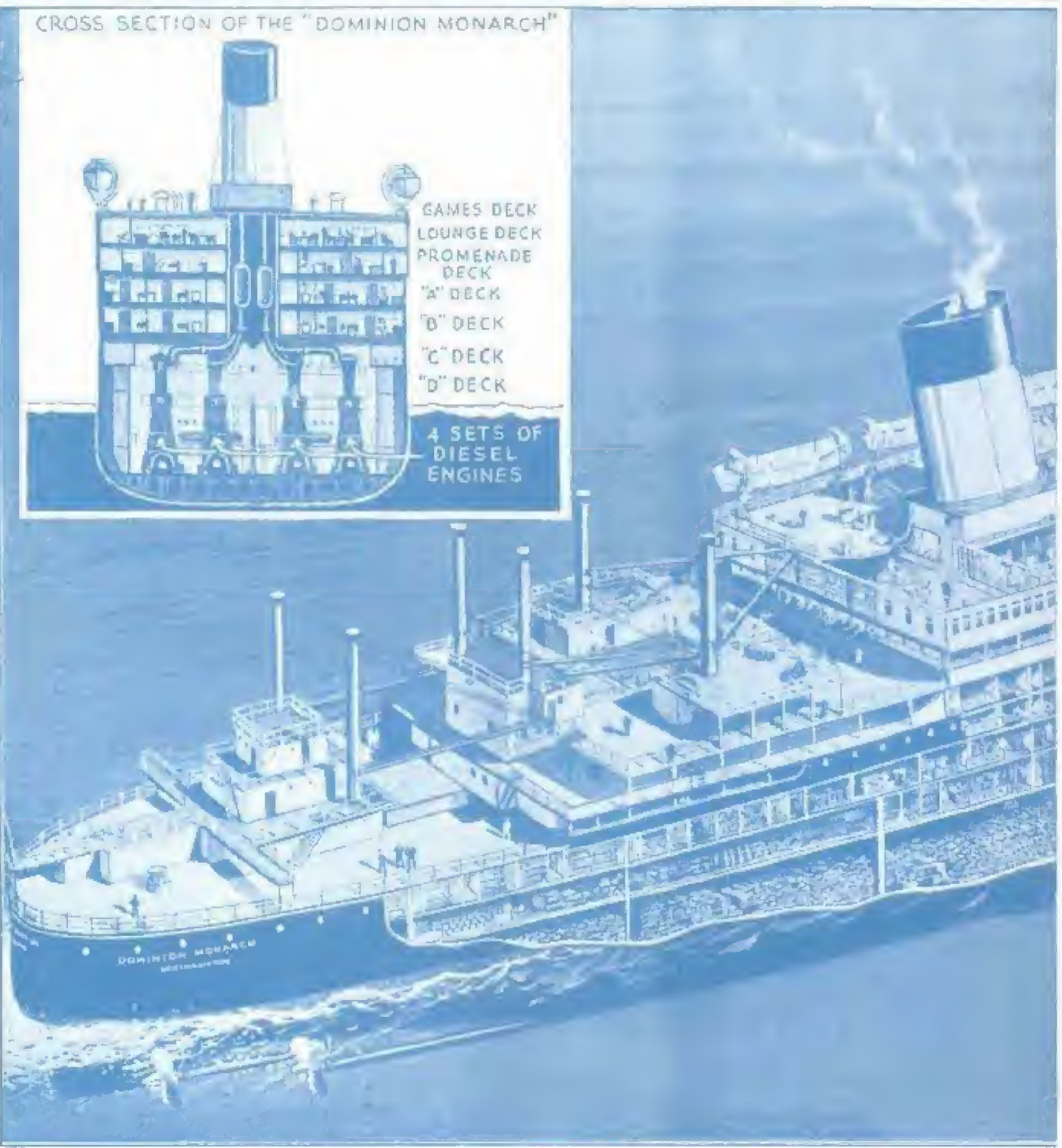
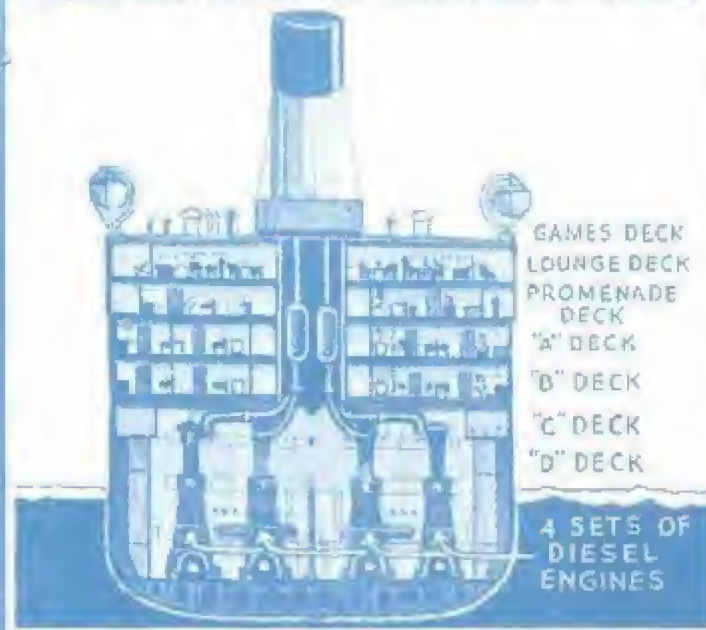
Gasoline used in 1938 reached a record total of 521,657,000 barrels.

Chicago News 2/9/39

Thomas Harris, 159 Georgia Ave
Providence R.I.

GIANT DIESELS *Drive*

CROSS SECTION OF THE "DOMINION MONARCH"



POWERED by quadruple Diesel engines capable of developing 32,000 horsepower, England's latest queen of the seas, "Dominion Monarch," is regarded as the most powerful British motor ship afloat. The battery of engines, turning quadruple screws, gives the ship a service speed of twenty-one and one-half knots. Only first-class passengers will be carried on this

liner, which is rated at 27,000 tons, and accommodations are unusually extensive. The area of the sports deck alone is 18,500 square feet. Passenger cabins and public rooms embody the latest features in modern design. Cargo space, too, is large, as the diagrammatic drawing on these two pages shows. Refrigerating machinery, to supply cooling for cargo and passenger

293...
 Cliver: Shaw, Savill, and Albion Co
 24, Leadenhall St. London E.C.3 England

Illustrated London News
Jan. 1939 295

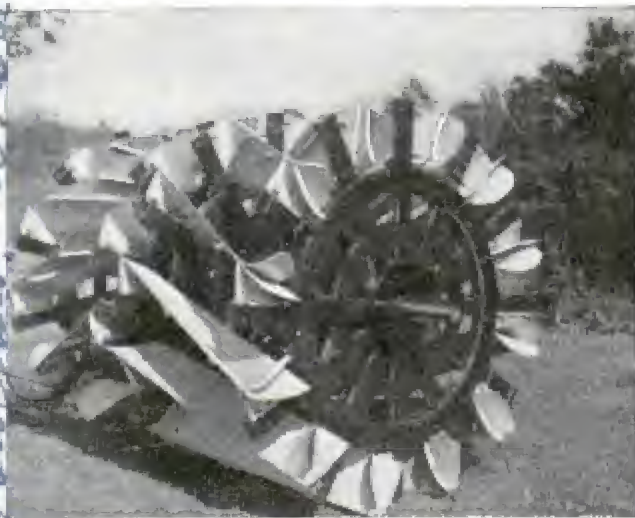
New OCEAN QUEEN



needs, requires four 160-horsepower motors. Two ninety-horsepower motors are used in connection with steering. An emergency lighting plant is driven by a 150-horsepower engine coupled to a 100-kilowatt generator. Equipment of the vessel includes a complete sewage installation, electrically operated watertight doors, fire-and-smoke protecting system, a special

fire-extinguishing system, echo sounder, radio and complete gyrocompass, as well as a sound-reproducing system with fifty-five loud speakers. The vessel, the largest engaged in regular passenger and cargo trades between England and New Zealand, via South Africa and Australia, is scheduled to reach Capetown in fourteen days, and New Zealand in thirty-five days.

Paddles That Prevent Swell Built for River Boat

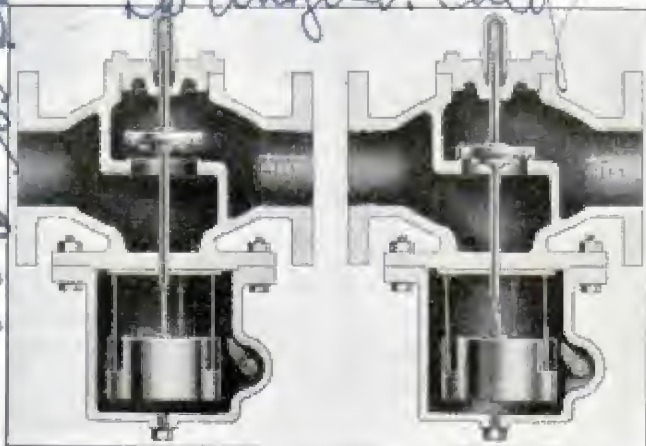


Unusual design of this stern paddle for river boats prevents high swells which would damage shore

Heavy waves can cause considerable damage to banks along small rivers, and to prevent the waves raised by ordinary paddle-wheel boats a special stern wheel has been designed. It has twelve curved paddles on each side with curved fins at the end of each blade.

Earthquake Shuts Off Gas Valve to Prevent Outbreak of Fire

Fire following an earthquake often does more damage than the shock itself, and frequently the cause of fire is the ignition of gas from broken mains and pipes. To prevent escape of gas after a quake, an automatic shutoff valve has been devised which is operated by the earthquake itself. A heavy weight is suspended in the base of the valve by three metal wires, and

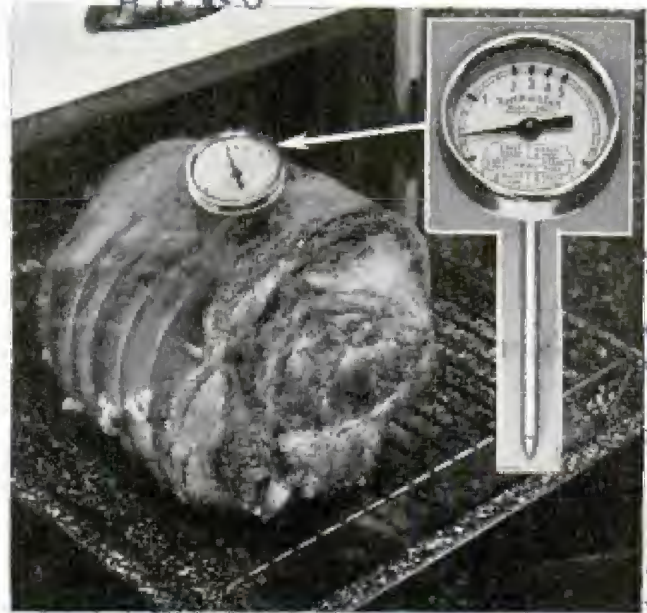


Left, gas valve in open position; right, quake shakes stem from balanced spindle and valve drops shut

when the body of the valve, attached to the building, is moved by the shock, the weight remains steady because of its flexible suspension. Thus the valve stem, which has been poised on a spindle projecting up from the weight, is displaced and the valve drops to its seat and shuts off the gas. A short curved lever or cam at one side of the weight can be operated manually to shut off the gas in the building in case of fire without an earthquake.

Roast Meat Thermometer Tells When to Remove from Oven

Correct roasting time for different kinds of meat is assured by a special thermometer with a pointer that tells the cook when to remove it from the oven. Mounted on a long stem which is inserted deep into the

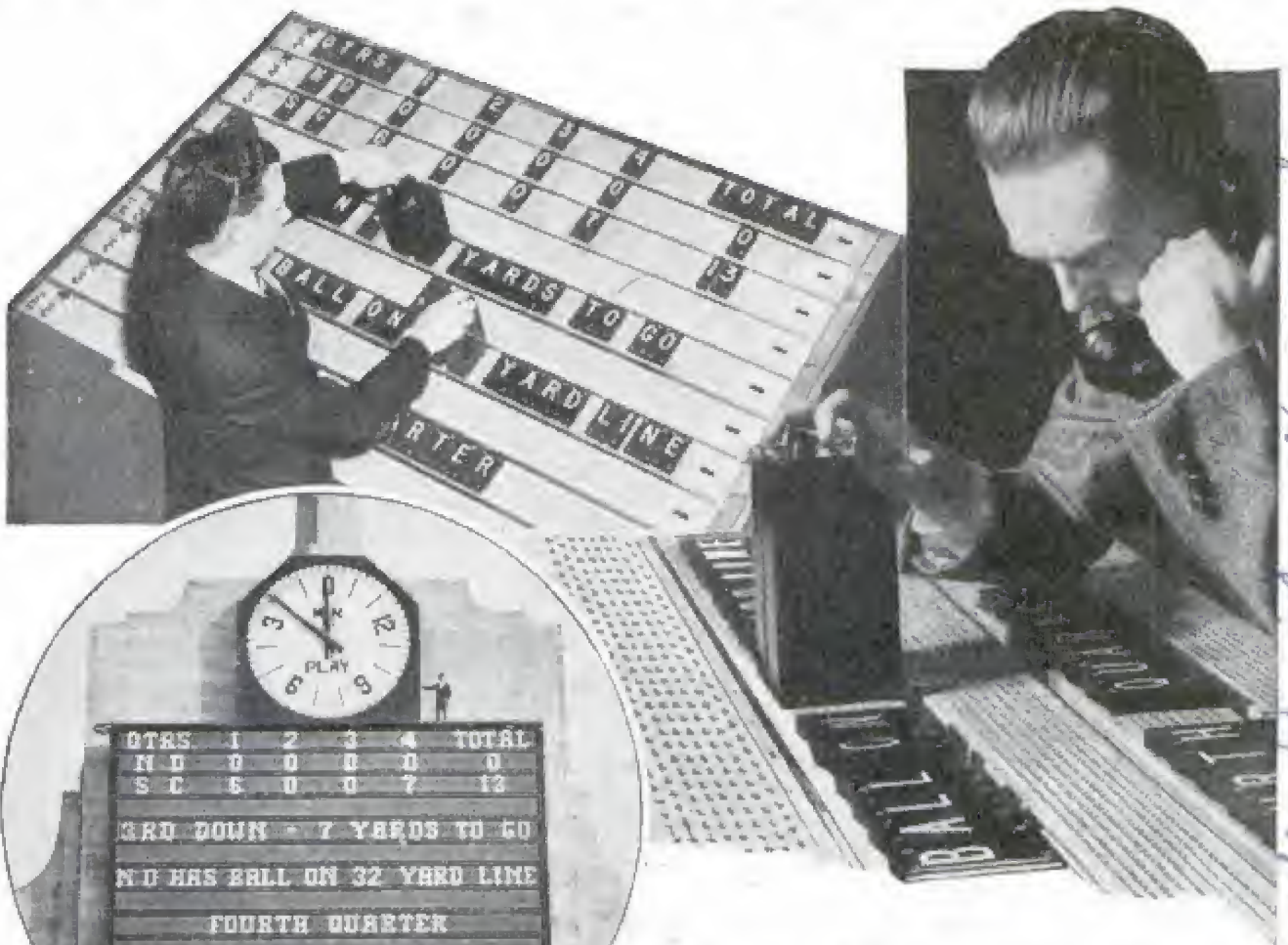


Roast is done when pointer reaches correct figure as indicated on thermometer dial shown in inset

lean part of the meat, the instrument has a dial separated into five sections showing stages of roasting time. When the pointer, which moves clockwise over the face, reaches the numbered section recommended for the kind of meat being prepared, the roast is done. To meet individual tastes, it may be done extra well by allowing the hand to advance a little farther than called for in the table, or not quite so far if a rare roast is preferred.

¶ In the manufacture of 1,000,000 automobiles, it is estimated that agricultural products from 500,000 acres are used.

Giant Electric Scoreboard Is Set Like Type



You can write in any language on the vast electric scoreboard of the Los Angeles Coliseum and the letters, two feet high, flash instantly as you plug them into the "makeup" board behind the scenes. At left, above, is operator at layout board and below the sign as it appeared from football field. Top, right, operator receives report from field by telephone and manipulates tall control panel to change yardage numeral. Face of scoreboard comprises 12,000 forty-watt lights

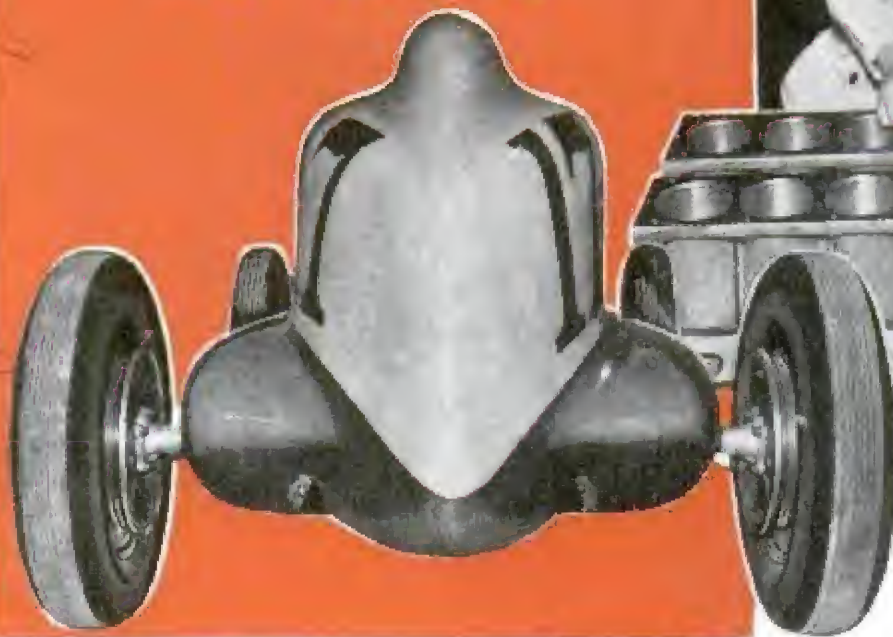


One hundred miles of wire, above, connect light sockets with plugs in layout table. Right, letters are filed alphabetically like typesetter's case. Men who operate board never see events, but receive orders by phone and loudspeaker and set letters in fiber strips as a printer sets line of type. One line can be set while another is lighted. Rheostats permit three light stages



With a master 4-5-7 Los Angeles
 Control Console

NEW CARS *for* the **KINGS** *of* **SPEED**

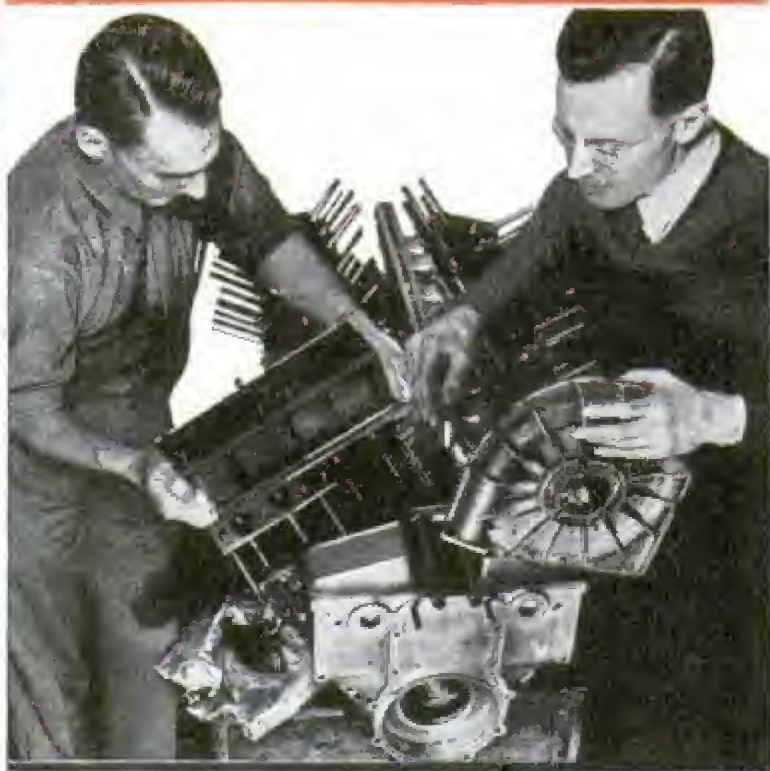


FOR six consecutive years the world's best drivers, bent over the wheels of the fastest cars in the world, have smashed speed records at the Indianapolis race.

This year likewise, barring unforeseen accidents or weather, speeds never attained before will be made at the 500-mile Memorial Day classic.

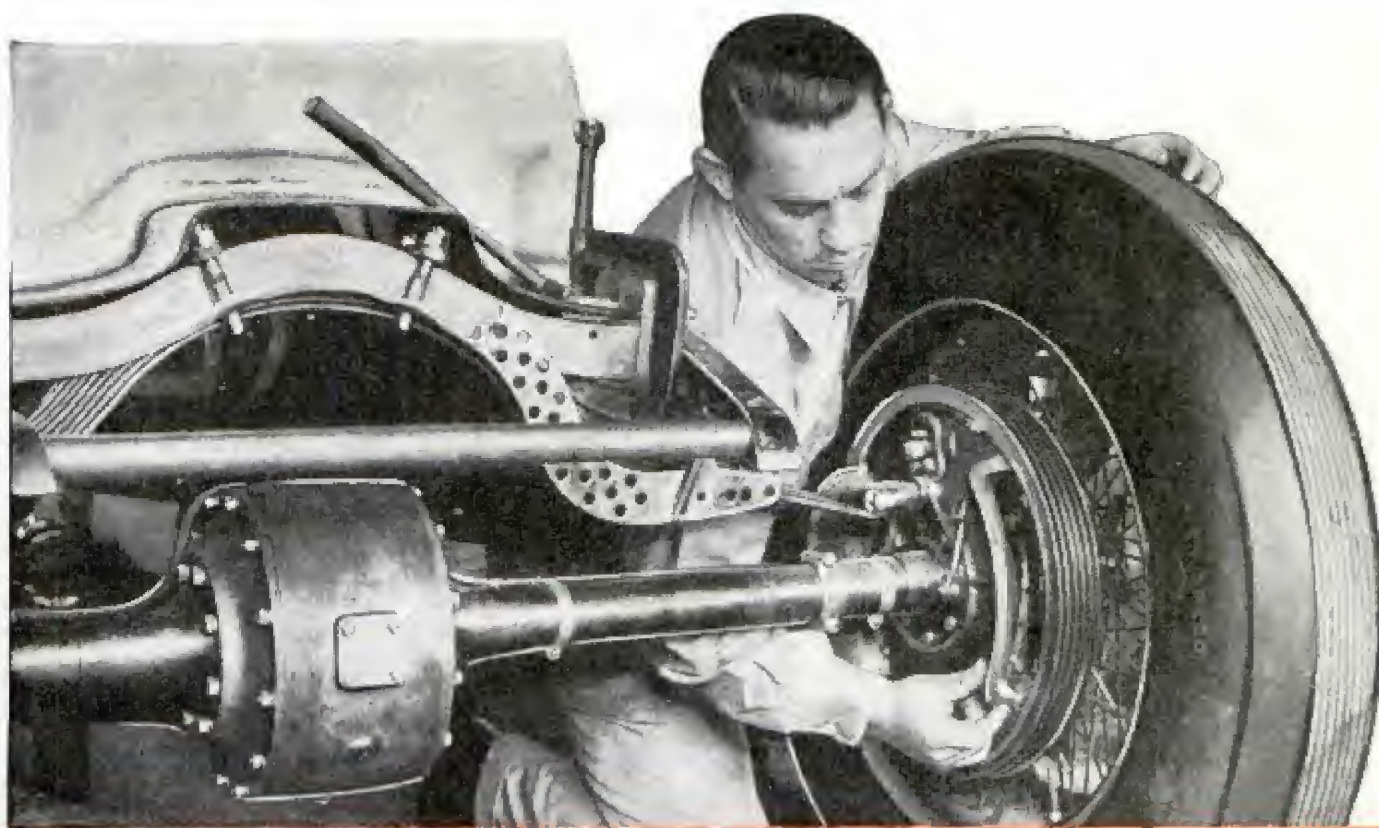
Never has the fight to win America's blue-ribbon race event been so strenuous. The race really started last fall when owners, drivers, and mechanics began to plan cars and engines. The thirty-three entries will represent a cost of nearly half a million dollars.

An up-to-date race car costs from \$12,000 to \$25,000 and nearly every part is made by hand. A sixty-five-pound crankshaft is turned down from a fat forging that weighs 356 pounds; a six-pound wheel hub is made from a chunk of metal that weighed seventy pounds at the start. As much as 125 hours of labor are spent creating a single connecting rod.



Top, rear of 1939 racer showing streamline headrest, body and frame. Right, Fred Offenhauser checking bore of engine blocks. Beside him is heavily balanced crankshaft. Bottom, mounting supercharger and four-cylinder block on sixteen-cylinder motor

141545



One owner is using a full-scale duplicate of the camshaft and valve assembly of his engine to study valve and spring action at different speeds through a stroboscope.

This year, as usual, men who drive with their heads as well as their feet are going to lead. Nearly half a dozen former winners are competing. Most of them expect it will take an average of 120 miles an hour including pit stops to win, nearly three miles an hour faster than the winning speed last year. The one who gets the pole position may have to qualify at close to 135 miles per hour, for the qualifying runs will be only four laps long, a distance so

short that drivers won't have to worry about wearing out tires.

Although the speed may be faster than ever, the drivers will not receive as much punishment as in the past. The two-and-a-half-mile track was originally surfaced with brick; wear gradually turned it into a bumpy course hard on both cars and drivers. Last year the turns were resurfaced, permitting faster driving, and this year the long backstretch has also been repaved. Last year's rules apply this year as well.

One of the outstanding cars this year is powered with a sixteen-cylinder engine



Top, ventilating orifice and ribbed surface of brake housing promote rapid cooling of four-wheel brakes on Joe Thorne's car. Below is a diagram of the sixteen-cylinder Sampson "Comet"

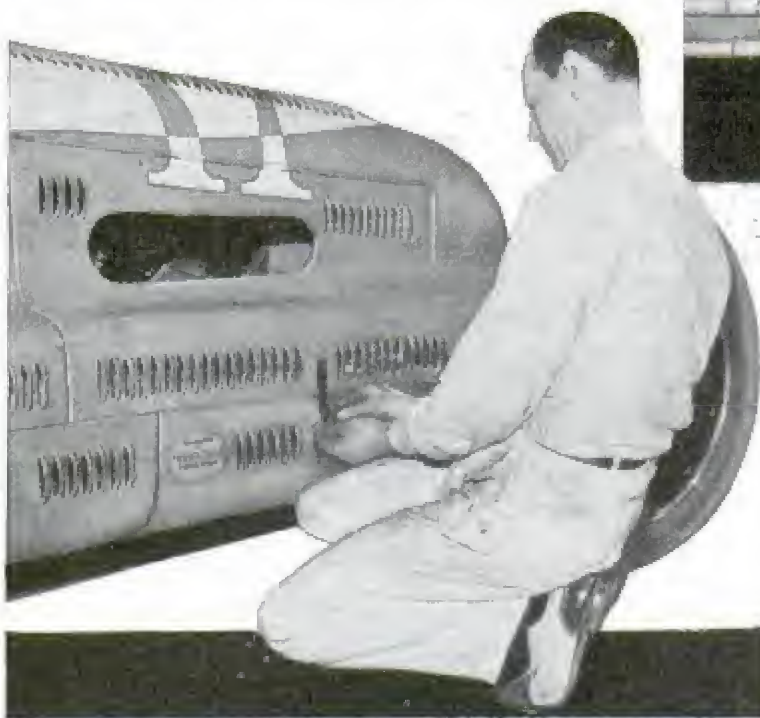
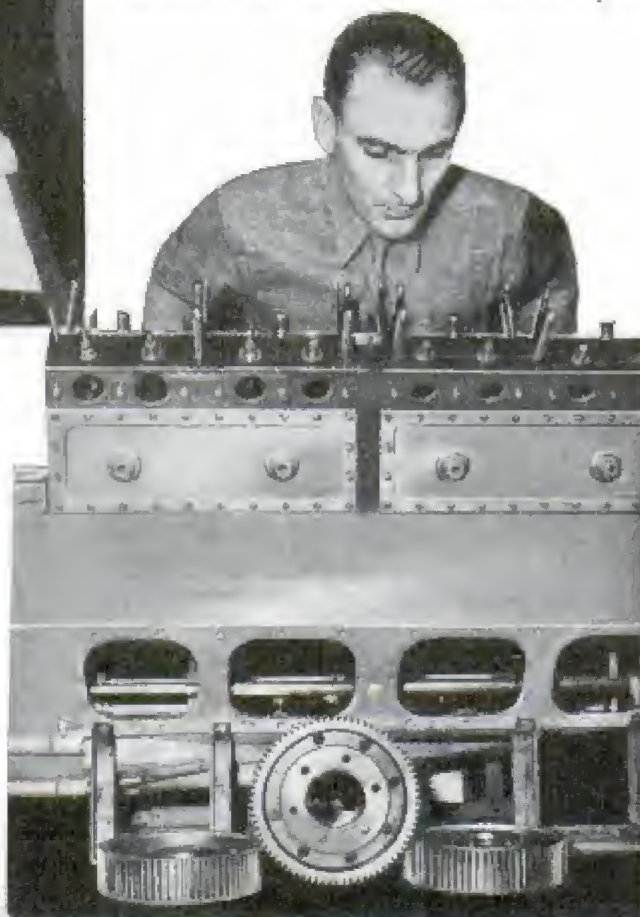
see May 1940-705



that develops close to 500 horsepower, more than twice as much as some of the other motors. The car is to be driven by Bob Swanson and is owned by Sampson Motors Corporation. The motor, originally built by Frank Lockhart, consists of two eight-cylinder in-line engines mounted side by side on a common crankcase. The two crankshafts are geared to the drive shaft at the rear of the block. The motor is

of 183 cubic inches displacement and "winds up" to nearly 7,000 revolutions per minute. Bore is two and three-sixteenths inches and stroke is three inches. Each bank of cylinders has a supercharger and the engine is cooled by a double interconnected radiator.

The car itself looks more like a bullet than do most race cars and is seven inches lower than the av-



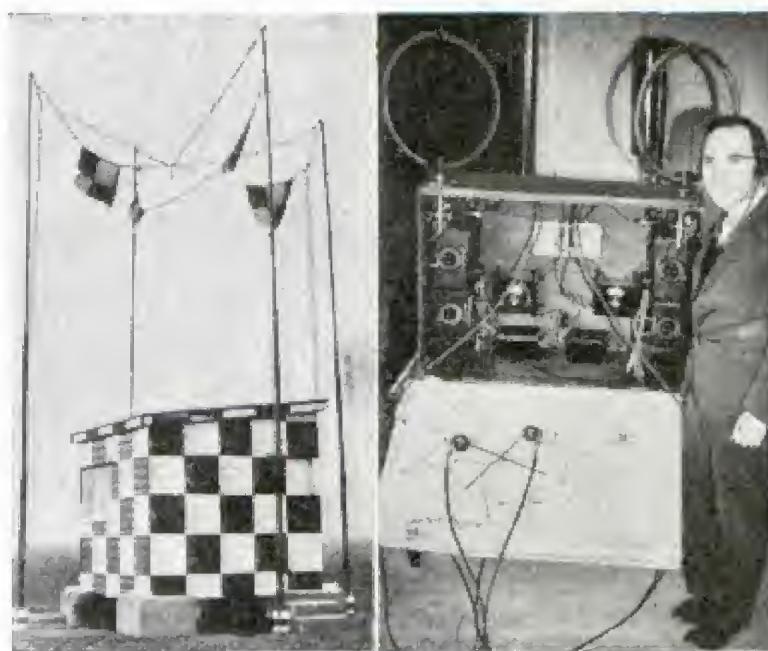
Top, Leo Goossen laying out plans for racer. Right, Alden Sampson, owner, inspects sixteen-cylinder supercharged engine before mounting it in car to be driven by Bob Swanson. Bottom, mechanic straps hood; louvers ventilate engine and oil supply

erage, the top of the driver's head-rest being forty-one inches above the ground. To reduce unsprung weight, Leo Goossen, the designer, employed the European practice of using an underslung transmission carried just ahead of the rear axle, both transmission and differential being supported rigidly from the frame. Gear shifting is accomplished through a conventional shift stick attached to a rod leading back to the transmission.

To obtain maximum traction and roadability the car has double quarter-elliptic springs in front and a torsion-bar type of suspen-

(Continued to page 116A)

Radio has given to aviation two additional safety features, developed in England, one of which is virtually an automatic navigator showing the pilot his position within a radius of two miles at all times. Two automatic direction finders, operating continuously and simultaneously, are actuated by a robot leading to a map on which two pointers cross; at their intersection is the airplane's current position. With the other apparatus, also in the nature of a direction finder, radio-equipped planes flying in fog can be brought safely to earth from distances as great as 500 miles from the "checkerboard" hut in which the equipment is housed.

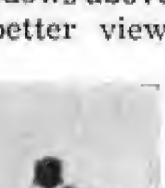


Left, hut containing direction-finding equipment. Right, pilot always knows his position by noting where pointers cross

Six firemen ride in safety in the cab of a streamline fire engine whose cab-forward construction offers greater visibility and



With low center of gravity and a wheelbase six feet shorter than the average fire truck, this pump and ladder car makes short turns at high speed



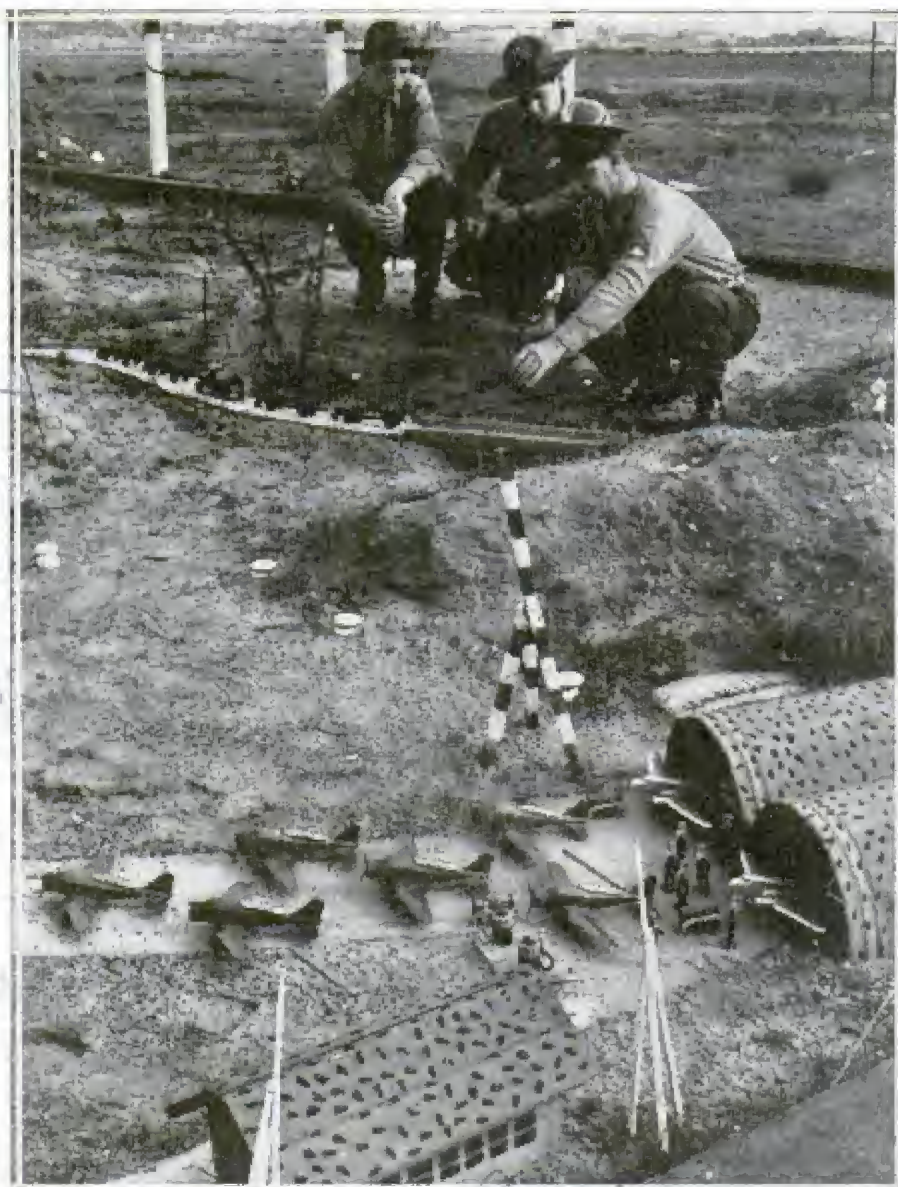
ease of maneuvering at high speed. Glass windows above the regular windshield give a better view overhead in approaching a fire. The wheelbase is six feet shorter than the average conventional truck, and weight is evenly balanced. This, combined with low center of gravity, permits fast turns in congested traffic. The turning radius is about ten feet shorter than average. The cab is steel welded. Ladders, axes and other equipment are carried in the rear, and the pumps, at 400 pounds maximum pressure, deliver from 500 to 4,000 gallons per minute.

Perforating the wings of an airplane may seem to be an invitation to disaster, but a British aeronautical engineer has demonstrated that such an arrangement increases the rate of climb and speed. When an airplane flies at high speed, the air acts very much like a liquid, adhering to the wings

and body of the ship and creating a drag that hinders its progress. To remove this "sticky" air from the wings, their surfaces have been perforated and a blower is installed in the airplane to provide suction for drawing away the speed-killing layer of atmosphere.

J. H. Is. Miles, London, England
Managing Director, B. & C. Co.

Student Marines Play at War on Miniature Field of Battle



Privates at marine corps school have a lesson in tactics made realistic by use of models on miniature outdoor battlefield

To lift their study of war tactics out of the routine of paper problems, the marines at San Diego, Calif., play war games on a miniature battlefield in the open air. Model tanks and field artillery are moved along roads laid across the rough terrain, there is an airport with a fleet of tiny planes housed in improvised hangars, and the theater of war even has its miniature radio station.

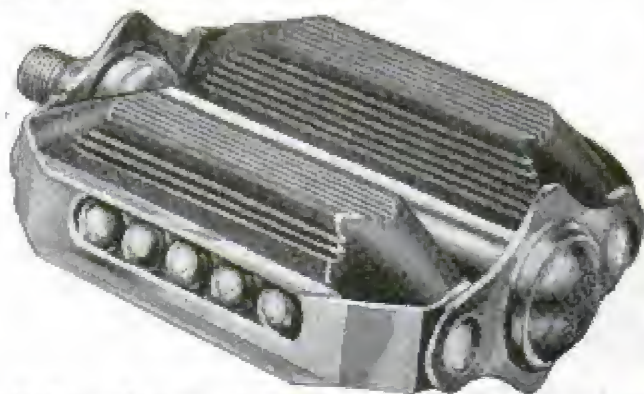
Wind Direction at Night Is Shown by Flares Attached to Balloons

Thin rubber balloons carrying aloft a series of magnesium flares help take soundings of night winds at sea, and reveal not

only the direction and the force of the wind but also the turbulent areas and eddies. A pair of 180-degree cameras record the progress of the balloons as shown by the flashing flares which are fired at regular intervals. Heretofore a theodolite was used to measure the progress of a balloon carrying a light, but these observations could be made only every thirty seconds, which is too slow to obtain the detailed data that are particularly important for pilots attempting to land their planes on the comparatively small deck of an airplane carrier.

Reflectors on Bike Pedal "Wigwag" Up and Down

Bobbing up and down in constant motion, reflectors set in the pedals of a bicycle can be seen at a distance of 150 to 200 yards. As the pedals turn, light beams entering the glasses in ever-changing angles are easily observed from the front or rear by motorists. The rows of reflector buttons, cushioned in rubber, cannot be obscured by the heels of the rider.



Pedal reflectors, always in motion, attract eyes of motorists following behind or approaching rider

Model Dutch Village Built for Tulip Festival



Hobbyists of Holland, Mich., joined in a community undertaking to build a miniature Dutch village that will be featured during annual tulip-time festival in May. Above, sculptor working on some of eighty costumed figures which people the village. At right and below, scenes in village and a thatch-roofed farm cottage, built to scale of one inch to the foot. The tiny figures, posed at labor, love-making, fighting and frolicking, are of clay coated with copper to stand weather



Blunt-nosed boats in model town ride canals of tar-painted galvanized iron. Tile roofs are made of inch strips of iron pressed in hill-and-dale form and painted orange-red. Houses of quarter-inch waterproof plywood are given antique brick effect by rubber pad stamped in brick-red oil color. Dry color is dusted on, dark green on the thatched roofs to produce effect of age, dark red over brick finish of houses and walks, dirt color on brick streets. The house walks are painted dirty white before imprinting with paint-covered pad. Farm animals all are hand-carved from white pine

Seeing the **WORLD**



Riot, top, was "shot" from canopy where newsreel man was safe from clubs but not from bullets which killed twenty-four people. Below, a "short" takes cameraman under the sea



STRAIGHT on its course toward the French border the little two-seater raced. Cameraman Marcel Dufay hugged seven precious cans of film as he looked anxiously over his shoulder. Just a few minutes before, the pilot's trained eyes had detected a black spot above and behind him. Now that speck had taken the ominous shape of one of General Franco's warplanes.

"A Heinkel!" the pilot shouted above the roar of the motor. "It's going to be a close shave."

Dufay nodded grimly and hugged the cans even more tightly. There were 7,000 feet of newsreel in those seven cans. For weeks Dufay, ace cameraman for Pathe News, had been with the Loyalist army. He had risked his life a score of times. He had shot the Abraham Lincoln Brigade in action, been sniped at by Moors and dodged bombs in Barcelona but kept his camera grinding all the while.

Then, his job finished, the iron hand of censorship had clamped down. Refused permission to take his films out of the country, he hired a plane to fly them out.

With a last burst of speed the little two seater went into a power dive. They were over Hendaye on the French-Spanish frontier. Fifteen minutes later they con-

Cont. Emile C. Schürmayer, 10886666
St. New York

in TEN MINUTES



gratulated each other as they came down on French soil.

A French customs guard came up to inspect their plane.

"What have you in those cans?" he asked.

"Exposed film. I'm a Pathe News cameraman," answered Dufay.

Despite Dufay's frantic pleading, the customs man ripped the tape off each can, lifted the protective lids, peeped at the contents.

"You're right, monsieur," he said apologetically. "It is film."

Top, camera crew borrows derrick for "angle" shot. Center, Ethiopian scene by Universal newsreel photographer. Film men found the war in Africa costly and generally unsatisfactory subject. Right, RKO-Pathe News crew with sound camera costing \$10,000



Above, telephoto lens resembles gun too closely for comfort at war front. Right, Fox Movietone men stuck in Ethiopian mud. Below, helmeted cameraman films history in making

Dufay looked ruefully at his 7,000 feet of lightstruck film, all ruined. He thought of those weeks of dangerous work. Then he cabled the Pathe assignment editor in New York City. A few hours later he received a laconic reply. "Too bad. Try again."

"That is one of the reasons why it costs from \$20,000 to \$25,000 to issue a newsreel these days," says Frederic Ullman, Jr., vice president and general manager of Pathe News. "At that, it's not too much to pay so that the public may see history enacted before its eyes."

"Dufay went back again, of course. He shot more footage. He figured a different way to smuggle the film out of Spain and did it successfully, as you may have seen on the screen in your own theater."

The newsreel today is different from the newsreel of a few years ago. Gone are many of the baby parades, beauty contests, cute animal sequences and other chestnuts which formerly were shot year after year. Faster, shorter, more important

is the yardstick of this world-wide business. Now within the span of five hours—and in the case of outstanding events such as the New England hurricane, three hours—a New York audience sees the subject on the screen. Within a week 60,000,000 Americans have seen it. In a little more than a month it has been shown all over the civilized world. Then it becomes a living archive for historians of the future to mull over and resurrect a vivid picture of what really happened and what was said.

"Motion picture film travels through a projection machine at ninety feet a min-



Box Melone



ute," says Mr. Ullman. "In that minute a monarch could be dethroned, a city destroyed, a nation's future decided on a piece of treaty paper, a race or a battle won. Since the war the public has been conscious of the significance of events. A man may read his destiny in streamer headlines across his morning paper. The average reader is as familiar with the Sudeten incident as he formerly was with the batting average of Gehrig, or the domestic difficulties of Jiggs. Beauty contests no longer excite as much interest as the home life of a politician. People want more than idle diversion. They want to see history in the newsreel because they realize they are living in it."

Because of this trend there have been many changes in the newsreel business. The day of the free-lance cameraman is about done, for he can neither afford the expensive equipment nor can he compete in speed and efficiency with the crew assigned the big story. Every once in a while, however, some free lance or amateur who happens to be on the spot when a major news break occurs, sells his footage at a good price. Even an amateur's sixteen-

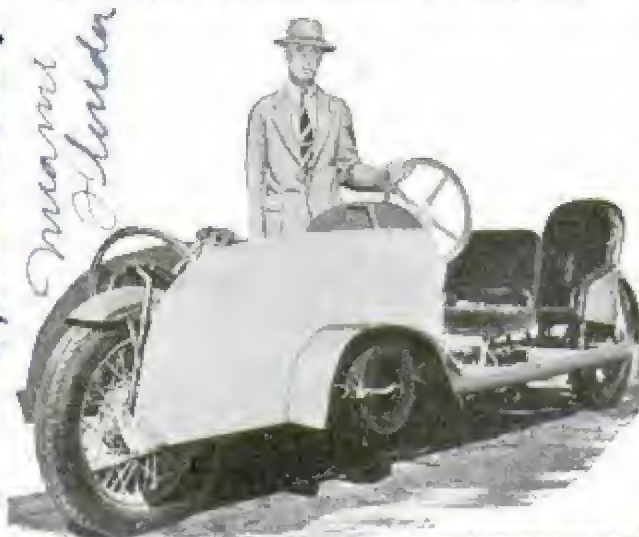


Camera historians cover the world. Top, "shooting" a state pageant in Cairo, Egypt. Below, Universal's Roy Edwards films the New England hurricane

millimeter film has been bought when the story was exclusive and important, although the absolute minimum of this is transferred to thirty-five-millimeter film as it "blows up" badly when projected on a large theater screen.

(Continued to page 126A)

Motorcycle and Car in One Parks on Extra Wheels



Above, parking wheels being lowered at curb. Below, they retract when two-wheeled auto takes to road

By combining into one vehicle features of both the automobile and motorcycle, an inventor of Miami, Fla., has built a two-wheeled automobile with two extra "outrigger" parking wheels. At regular driving speed the latter are retracted into the car away from the road, but are lowered for parking at the curb and may be used also while starting or running at slow speed, since they are turned with the front wheel by a synchronized steering apparatus. The machine has a small four-cylinder motor.

Plane Engines' Speeds Equalized by Automatic Synchronizer

Bumpy "beats," produced in airplanes with more than one engine when their propellers spin at different speeds, are eliminated by an automatic synchronizer that drives both engines at exactly the same speed, and keeps them more finely adjusted than could the most skillful pilot. The heart of the unit is a small electric motor of the differential type having two

windings, one of which is fed from an alternating current generator driven by one engine, and the other with current from a generator powered by the second engine. If the two engines are operating at the same speed, the current fed into each winding will be of the same frequency and the differential motor will not operate. On the other hand, if the two engines run at unequal speeds, the current derived from the faster engine will be of greater frequency and will turn the differential motor. When this occurs the differential motor alters the setting of the propeller blades to bring the speeds of the two engines into line. The action is quick and sure, because it does not have to "hunt" for the exact synchronization point.

Automatic Telegram "Mailbox" Sends Facsimile Message

With an automatic telegraph transmitter developed by Western Union, it is as easy to send a telegram as to mail a letter. The procedure is virtually the same except that you must push a button. You deposit the message through a slot in the instrument, which is inclosed in a cabinet not unlike a mailbox, and immediately a facsimile of your message is transmitted automatically



Dropping message in telegraph box, whence facsimile is automatically transmitted to the central office

Hamilton Standard
Prop. Div. United Aircraft

to the main telegraph office. The upper left-hand corner of the telegram blank is cut off diagonally and the machine will take it only if inserted face outward. When a message enters it is wound around a transmitting cylinder and revolved in front of a photocell, the apparatus being capable of sending fifteen square inches of matter a minute. Several machines may be connected with the same line, but if one of them is busy it is impossible to deposit a telegram until the line clears. In such cases the words "Line busy" become illuminated on a panel. Another panel at the proper time tells you "Message being transmitted," and when the process is finished a third panel reading "Thank you" lights up. Then the original telegram is "peeled" from the cylinder and dropped into a container. This type of telegraphy was made possible by the development of a carbon-bearing fibrous paper patented by the telegraph company.

Shipyard Builds Model Fleet for War Drill or Showcase



Miniature fleet "on review" in Berlin shipyard which produces model boats for naval training schools and for shipping company advertisements

Great fleets of ocean vessels—navy dreadnaughts, freighters and passenger liners—are "launched" from a model shipyard in Berlin. Building model ships has become an industry itself, with naval schools calling for tiny ships to teach battle strategy and reconstruct war maneuvers. Shipping companies, too, are using models more and more for window advertisements of their cruises.

Scooter on 31,000-Mile Tour Hauls Telescoping Trailer



Touring America on a scooter with bed packed in the trailer

When this picture was taken, Tom Herridge of Tarkio, Mo., had rolled up 31,031 miles on his motor scooter and was bound west through Arizona. He had visited thirty-nine states, Cuba, Canada, Mexico, Nova Scotia and the Bahamas and the tour was not ended. He could camp wherever he halted, for the small trailer telescopes out to provide sleeping space.

Unaided, a California miner spent thirty-two years digging a 2,000-foot tunnel to his gold mine.

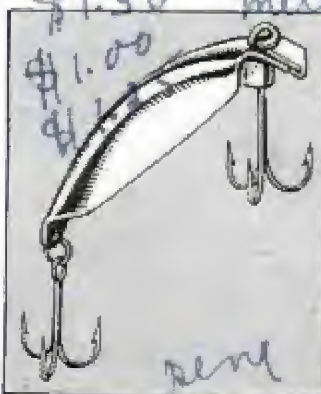
Small Electric Hot-Water Tank Has Temperature Control



Tapping hot water from two-gallon tank with automatic switch that snaps on or off as required

For kitchens, offices or shops where hot water is used in small quantities, an electric heater easy to install holds two gallons. Its heating element is built similar to the larger ones, and an automatic thermostat switch operates to maintain the desired temperature at all times. Thick mineral wool insulation prevents escape of heat and saves electricity. To install the unit, you need only to screw a bracket plate to the wall, lift the tank into position, plug a cord into the nearest electric outlet, and connect a hose, piece of tubing or length of pipe to the water supply.

Non-Revolving Metal Fish Lure Easy for Catch to Strike

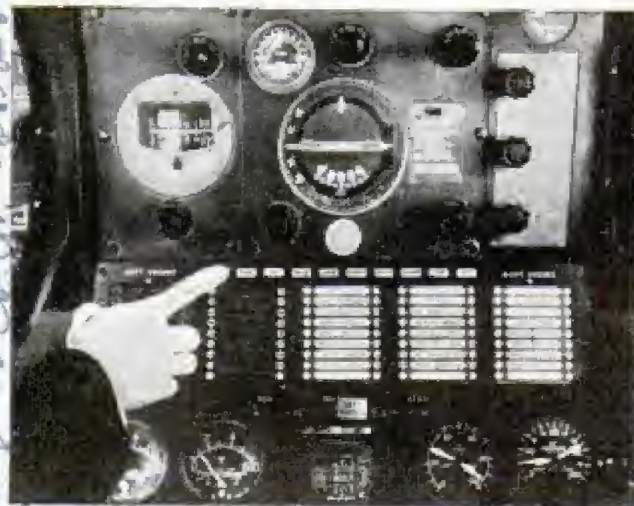


Shaped entirely from one piece of seamless brass tubing, a non-revolving fish lure will not twist the line and reduces missed strikes by traveling in a straight line. You can fish the bottom

of the lake by allowing the lure to sink before starting to retrieve, or you may reel a little faster to fish the surface of shallow, weedy waters. The bait produces a lifelike and vigorous swimming action and is said to attract fish at long distances. It is supplied with either a single or double set of treble hooks, being used both for casting and trolling.

Telltale Lights Warn the Pilot If Instruments Go Wrong

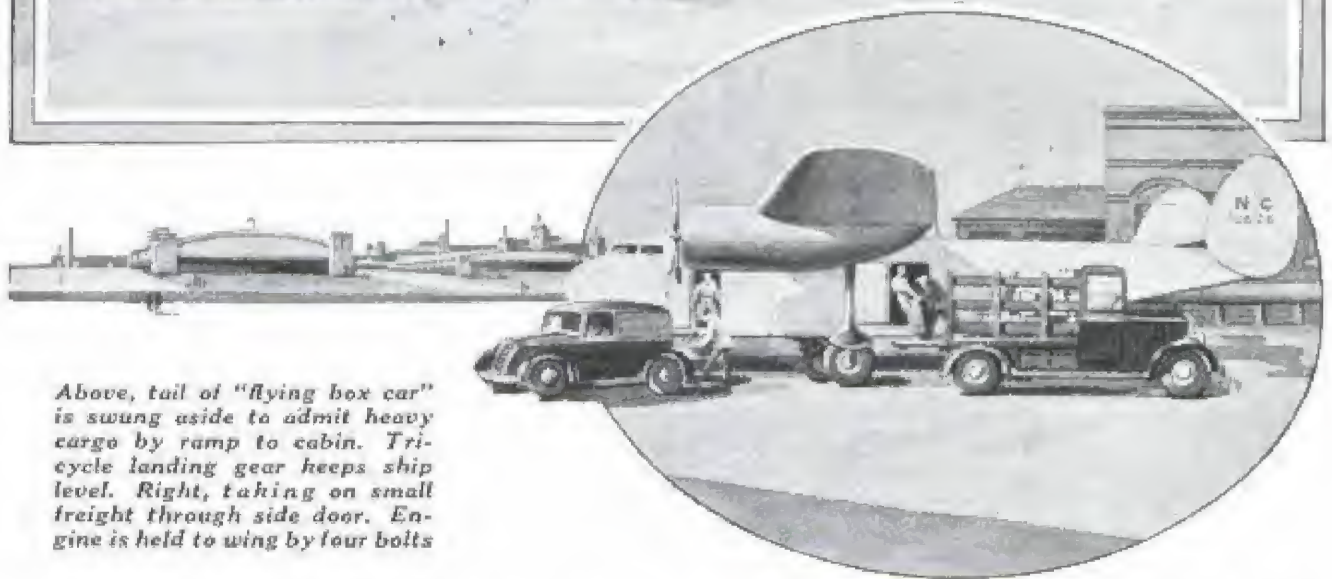
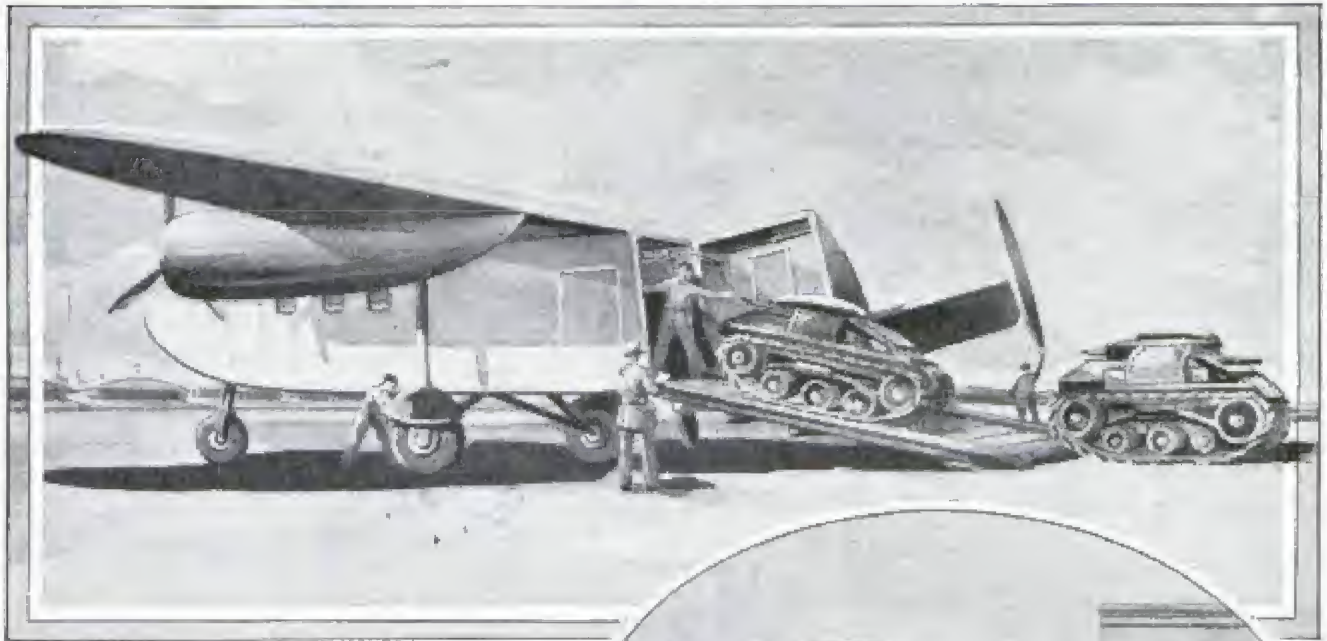
Pilots who fly the new thirty-passenger Curtiss-Wright airplane will not have to read all its instruments to be certain the controls and vital parts are working efficiently before a take-off, landing or other maneuver. They simply will turn to a new robot pilot, press a pre-selector switch corresponding to the operation contemplated, and telltale lights will flash signals to show whether the plane is functioning satisfactorily and the maneuver is being executed properly. Immediate warning is given if any instrument or control is not set correctly and needs to be adjusted. Developed from indicating systems used in the power industry and by railroads, the



If telltale lights flash when pilot presses button adjustments are needed. No light means "all's well"

robot is electrically connected to the various parts of the plane so a continuous report of their operation may be obtained. Giving the pilot a ready check on what he himself is doing is regarded as an added safety measure. Though the twin-motored airplane will be flown in the stratosphere, passengers will feel no ill effects from thin air in its pressurized cabin.

Sky Freighter Swings Hinged Tail for Loading



Above, tail of "flying box car" is swung aside to admit heavy cargo by ramp to cabin. Tricycle landing gear keeps ship level. Right, taking on small freight through side door. Engine is held to wing by four bolts

Freight carrying in the air until now has been done chiefly in rebuilt transport planes too old and obsolescent for further passenger service. From the aircraft plant of Benny Howard, noted racer, designer and air line engineer comes now a plan for a sky freighter whose tail swings on hinges to permit loading heavy cargo from the rear into its "hold," twenty-two feet long and a little more than seven feet high and wide. The cargo space is big enough to accommodate a small truck, and the plane, designed for powerful lift rather than great speed, can carry four tons of pay load at 150 miles an hour. Small cargo could be loaded through a side door without swinging open the tail. Tricycle landing gear holds the body level on the ground, and makes it safe to land a heavy load in a small field and take off again, lightened. The twin motors are to be suspended under the wings, fastened by four bolts. Thus it would be simple to remove engine and

housing, which encloses also the fuel tank, and quickly install a new power plant. The engine nacelles would be of standard dimensions so that motors removed from passenger ships after operating their legal limit of 5,000 hours, but still capable of plenty of travel, could be installed on the freight plane along with propellers which have gone the allowed limit of 2,500 hours on passenger carriers. The sky freighter would have an eighty-two foot wing span and overall length of sixty-three feet four inches. Besides its use by companies requiring a strictly freight-carrying airplane, passenger lines could use the "flying box car" for mail and express when heavy shipments might otherwise crowd out passengers. Although designed primarily to fill a peacetime need for strictly freight-carrying planes, the ship would be adaptable for army transport purposes in war, carrying supplies, equipment, small artillery, troops, and even light tanks as shown.

Bombing Class Practices Aim on Linoleum Map of Terrain



Practicing for destructive work in wartime, students in gallery of "bomb school" take sights on targets on a moving carpet

Target practice for beginners in the bombing class at a German military flying school is conducted indoors. From a gallery at one end of the classroom the student bombers take aim at strategic points on a patchwork terrain map printed on a linoleum carpet which is moved at a prescribed speed beneath the bomb sight instruments. The map is intended to represent enemy territory as seen from several thousand feet up. This training school for combat flyers is at Tutow, Germany.

Heat "Wrung" from Winter Air by Reverse Cooling System

No matter how cold the weather may be, there is always enough warmth left outdoors to heat a building—if you know how to get it. By reversing the operation of the

cooling system in an office building of Westinghouse Electric and Manufacturing company near San Francisco, Calif., engineers have succeeded in capturing heat units outside and releasing them into the rooms through hot-air ducts. In hot weather, the refrigerator again reverts to its original duty of removing excess heat. Investigation has disclosed that electrical energy applied in this way will deliver two to ten times as many heat units as the same amount of energy applied directly to ordinary electric heaters.

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Old Paintbrushes Stay Soft in Vapor-Filled Can

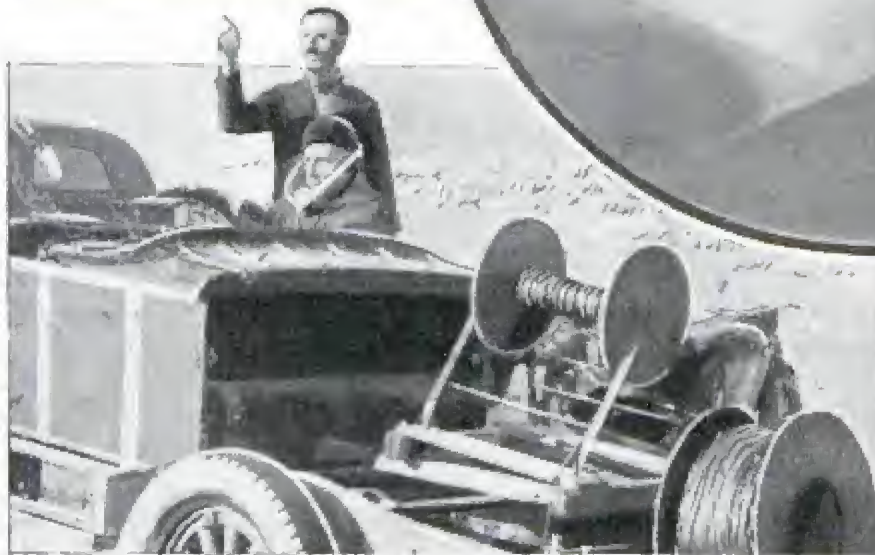
While still wet after being used for painting, brushes can be preserved by storing them in a can containing vapor that keeps the bristles soft and flexible. It is seldom necessary to wash them and they are always ready for use without cleaning. Also, old and partly hardened brushes can be reclaimed and put back into service after a week in the conditioner. A slowly evaporating liquid in the container generates a heavy non-inflammable vapor, driving out all the oxygen and preventing oxidization of the paint. One pint of the liquid will last several months, since the brushes are not immersed in it but remain suspended in the vapor.



Pouring liquid into brush container, and, right, view of can with brushes suspended from holder at top

Wisconsin Laboratories
9234 N. Wisconsin

Glider-to-Ground Phone Helps Pilot Take Off



Above, pilot ready to be towed adjusts head-phone and mouthpiece. Left, two seated glider in air. Bottom, towing cable at back of car contains telephone wire

Telephone hook-up between glider and launching car, tried at the Sussex gliding club in England, helps the pilot to be certain that flying speed is maintained for the takeoff. Wires are threaded through the

towing cable, and the pilot keeps in communication with the ground crew until he is in mid-air, since the phone connection is not broken until the moment he cuts his plane loose from the towing cable.

"Fish Eats Fish" Used as a Lure to Catch the Big Ones

When a Chicago fisherman hooked a fish and found a larger fish attacking his catch, he had an idea. It resulted in development of a "fish eats fish" lure, with one artificial fish swallowing another. The bait is calculated to attract big ones.

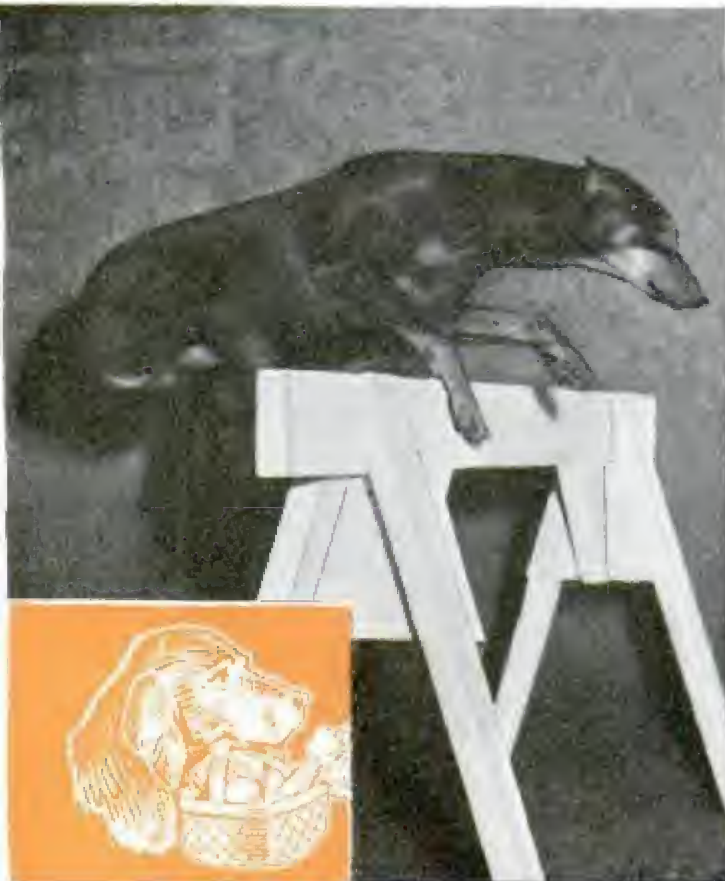
Motorists spent \$4,500,000,000 on vacation trips in 1938, the Automobile Manufacturers' Association estimates.



Fish swallowing fish is one of the newest lures

Chicago slaty news
2/9 3/9

at the Slyke, Brighton, England
Lloyd and
3496



"Bob of the Fair" - Ellsott
 Michael von Motzeck
 Michael von Motzeck
 Michael von Motzeck

HOW SMART is your

445 E. Erie Chicago



Ten-year-old Alsatian shown balancing water-filled goblet on his forehead can climb a ladder with a biscuit on his nose. He has a big repertoire of tricks, and wears a gold medal for saving his master's life

YOU can buy the smartest dog on the vaudeville stage—a dog that can add and subtract and spell and fool any audience at "mind reading;" but if you're not smart yourself the best-trained pup in the world will be a spoiled darling without a trick in his head within a week.

What breed is the smartest? That depends on the master. You may assert your shepherd dog or Doberman pinscher or setter or spaniel comes from the brainiest family. But Michael von Motzeck, owner and "dean" of the V. & M. training kennels at Chicago and three other midwestern cities, will tell you it makes little difference. Like his father and his Austrian grandfather before him, von Motzeck has spent a lifetime schooling dogs for stage and radio, for police and guardian work, and as companions for children, the deaf and the blind. To him dogs are individuals, not breeds. There are bright poodles and dumb Dobermans, just as there are clever Chinese and stupid Aryans. If you're a smart enough teacher, the chances are your dog will be a bright enough pupil.

Yes, you can teach an old dog new tricks, but it's better to start before the dog has a lot of bad habits to unlearn. Three months is a good time

Time All Stars
Prize Alsatian

121510

Alsatian show
at Crystal Palace
London, Eng. Lane



DOG ?

to start school, but your friend can still learn at ten years if he has confidence in you.

Obedience is the first lesson in dog kindergarten. Obedience is what saves the dog trainer on the vaudeville stage from embarrassment, for the four-footed actor will never fail to go through his routine properly if he has learned to be obedient. Get the confidence of your pet. Let him know you are the boss. Not by whipping or beating him. That would break his spirit, and no one wants a cringing, sulking dog even if it follows orders perfectly. Don't lose your temper. If the dog seems to be tiring of his lesson, drop it for the day and



Photo courtesy John Morrell Co.

Across top of two pages, von Motzeck puts Doberman pinscher through triple routine of jumping horse, leaping hoops and climbing into box. Top, right, going over jump at dog show after retrieving dumbbell. Below, training dog for protection work. Told to watch baby, the Doberman leaps at von Motzeck's arm to knock him down when he approaches pram



play with him. But once you have given an order to "heel" or "sit" or "stay" or "jump," see that the order is obeyed. Never let a dog get away with a refusal or inattention. He'll soon learn who's "head of the house" if you are firm, and he'll just as quickly learn to ignore you if he gets away with it once or twice.

Heel, sit, lie down, stay, come on. Those are the primary lessons in dog school. Teach them by using a leash and training collar. A well-mannered companion should walk with nose at your left knee, sitting when you pause, and not dashing off on investigations of his own until you give the command. Hold the lead in your right hand, slack, and with the left hand restrain the dog as you order him to "heel" or pull him back to sitting position at the command "sit." Repetition drums the lesson home. Von Motzeck will walk a pupil around, giving rapid-fire commands to "heel, sit, heel, sit, heel, sit" so fast the pup can scarcely keep up with him. In that way he holds the attention.

Once those primary commands are

learned, the dog should be accustomed to taking orders from your fingers. Use your fingers right from the start. Two fingers of the left hand in beckoning position for "come on" and "heel." The index finger moving downward tells the dog to sit. Point the fingers down for "lie down." Accompany the spoken command with the gesture and in time the dog should respond to the gesture without the voice.

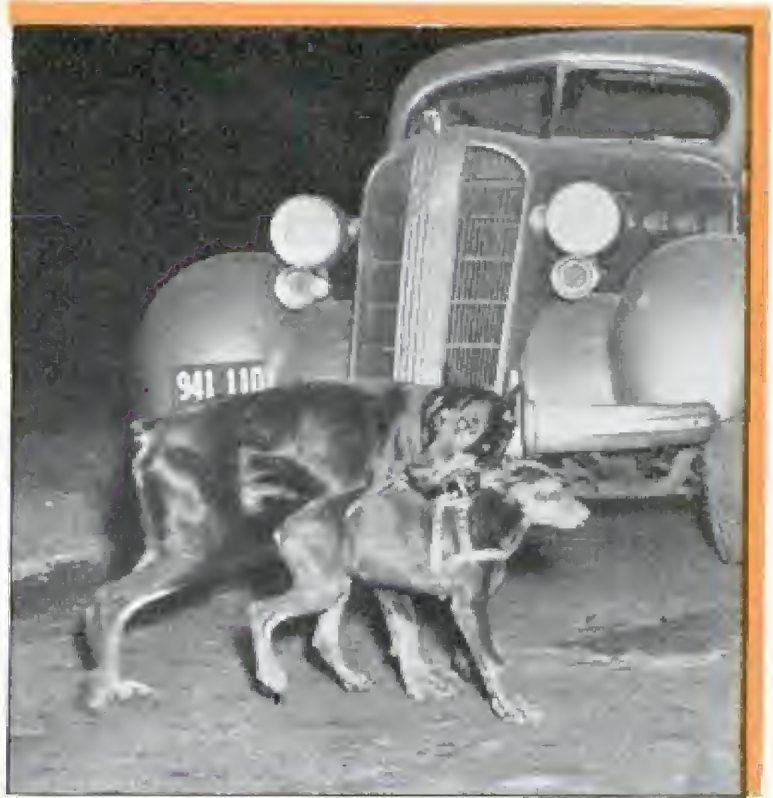
How smart your dog is depends upon how smart you are. If you keep your eyes open you can discover some little habit the dog has developed which can be turned into a clever trick. For a simple example, Mr. von Motzeck found one of his own pups liked to lie down beside his bed and cover his eyes with his forepaws. He looked so abject that von Motzeck made it a point to say "Aren't you ashamed?" whenever the dog assumed the attitude. A few repetitions, and soon the



Top, newspaper is used for first lesson in teaching dog to carry objects. Center, learning to climb a ladder. A bone or rubber ball placed on ladder steps will give him incentive to climb. Bottom, Irish setter obeys the finger command to "sit"

dog would take the apologetic pose at the word "shame."

Make training a game and the dog will join in enthusiastically. If it isn't necessary to beat a slow or unruly pupil, neither is it necessary to reward him with bonbons or bones. A rubber ball will do just as well. The other day at the "V. & M." boarding school von Motzeck started a dog at the rather complicated routine of jumping from the top of a small, theater piano to the floor, then through two hoops held widely apart, over a hurdle and into a hamper-type wooden box. The



Top, Doberman carries puppy across street, and is also taught to lead puppy by leash. Center, dog guarding pocketbook. Bottom, administering medicine; corner of mouth forms funnel and dog swallows if head is held high

only incentive was a red ball the dog was allowed to play with. It was placed in the box, and to get it the dog had to nose up the hinged lid, climb in, and then stay inside the closed box. In four hours of practice, broken up with rest, play and other routines, the dog learned the trick perfectly. Actually there were about twenty minutes of training on the stunt, counting out the interruptions.

Incidentally, to start a pup jumping through a hoop, over a hurdle or through similar maneuvers, use the same method you used for the teaching of primary commands—lead him through the maneuver with a leash the first few times. And to break him of chasing cars or crossing the curb, let him run on a long line and jerk it as he reaches the curb. By repetition

(Continued to page 122A)

Push-Button Index Flashes Hobby Book Titles



Pressure of button will light up window giving list of books and literature about your favorite hobby

Push the right button of a mechanical librarian at the Chicago public library and the "hobby-o-meter" will give you a list of books about your pet hobby. Buttons are labeled to indicate several of the most popular avocations, and when a hobbyist presses the one representing his own particular pursuit, a window lights up, revealing the title of at least one appropriate book and the name of its author.

Casting Rod with a Pistol Grip Has Adjustable Thumb Rest

Firmer grip of the casting rod and more sensitive control of the reel are given the fisherman by combining the pistol grip with an adjustable thumb rest. The latter may be set to fit any hand and leaves the



Pistol grip does not tire hand and permits firmer grip of the casting rod

thumb free to "feel" the line. An adjustable reel bed allows the reel to be moved back and forth and locked in any desired position. Both left and right-handed persons can use the rod with equal ease.

Electric-Light Socket Adapter Points Bulb at Any Angle

Electric-light bulbs may be swung to point in any direction by fitting an adapter into the standard socket. Placed in a ceiling socket, it can be adjusted at any angle vertically within seventy degrees, and may be turned 340 degrees horizontally. Light in weight and held in position by a set-screw, the adapter is made of composition and porcelain.



Toothbrush Rack Holds Tube Dispensing Toothpaste



Squeezing paste from tube screwed into center of toothbrush rack. The cap is attached to prevent loss

Toothbrush rack becomes a dispenser for toothpaste in a combination unit being offered. It accommodates six brushes, and at the center the toothpaste tube is screwed into standard threads and covered by a specially attached cap. Thus the tube is always handy and its cap cannot be lost.

Nelson "Pistolgrip"
Rod Co. 1010 Franklin

Elmer Jones, Box
118 Ross Calif

Planes with Folded Wings Ride Carrier's Deck



Airplane carrier "Ranger" passing through the Panama Canal; her planes with wings folded upward nestle closely together. Carriers gave good account of themselves in recent U. S. fleet maneuvers

When a fleet of Uncle Sam's fighting forces moved through the Panama Canal for recent maneuvers in the Atlantic ocean, a camera shot caught the aircraft carrier

"Ranger" with a deckload of flying fighters. Airplanes fold their wings upward after landing on the deck to conserve space on this "floating air base."

Supersensitive Calorimeter Feels One-Millionth Degree

So highly sensitive is a calorimeter with which two Northwestern University chemists are working that it can actually measure the heat produced when sugar dissolves in water. It is capable of recording a temperature change of only one-millionth of a degree. The substance undergoing study is placed in a metal vessel suspended over a vat, and temperature changes are recorded automatically. The calorimeter was designed for experiments on destruction of proteins.



Measuring minute temperature changes in a substance placed in one of the metal containers above vat. Heat graph is recorded on paper roll

It takes 12,000 man-hours of work to produce one of the huge dies used to shape auto body tops.

*Auto Facts
Jan. 1, 1939*

*Chemistry
Hugh Richard
The same as in the
1939*

TEST-FLYING *the*



Giant Boeing clipper taxiing in wake of tender. Circle, Consolidated navy patrol bomber on which Eddie Allen was consulting test pilot

lack of oxygen. The arrow of the altimeter quivered at the 29,000-foot mark when darkness blotted the throb of the motor from the pilot's ears. Allen's right hand, writing notes—data of the experimental flight—on a pad thonged to a knee of his heavy flying suit, became limp and dropped. His left hand, maneuvering the

THERE was no fighting off this sudden oblivion brought on by rarefied atmosphere at the tremendous altitude. Alone in the tiny pursuit plane, Test Pilot Edmund T. Allen—the conqueror of untried planes—was in the most critical jam of his career.

No human could retain consciousness without special equipment to offset the

controls to drive the plane to its nearly six-mile height, loosened and slipped downward.

The pilot's body wavered as the plane began to buck and sway crazily, then toppled forward, crumpling over the control stick and jamming it forward, throwing the plane into a power dive. With the wind screaming over its wires, the plane hurtled

*Capt. Ross L. Cunningham.
4516 W. Concord St.
Los Angeles, Calif.*

SKY GIANTS



Official photo
U. S. Army Air Corps

down, down and down, carrying its master toward destruction.

The plane rocketed for 7,000 feet before the more normal air allowed Allen's mind to begin to live again. For seconds the dazed aviator grappled with the problem of whether he was in a bad dream or an out-of-control airplane plummeting downward. Slowly his mind brushed the last of the darkness away and he recovered the controls, then quickly maneuvered the plane into proper flight. Spiraling downward and landing was a simple routine.

Adventures like this are not all in a day's work for Eddie Allen, who since that day ten years ago has burned his name into aviation history as a premier test pilot, or aviation consulting engineer, as he prefers to be known.



Top, taking this huge warplane into the air on its first test flight was Allen's job. Bottom, Allen talks by radio with ground crew while testing open plane



It was, however, the most exciting series of seconds in his twenty years of flying. Allen, like all steady aviators, has no lack of regard for longevity. This makes him careful, almost afraid, of untried planes and undoubtedly is one of the contributing factors to his having been selected to test many of the large planes built for trans-oceanic, commercial sub-stratosphere or military flying.

His hands were at the controls during test flights of the Boeing XB-15 "Flying Fortress," the world's largest military plane the Sikorsky S-43 clippers that span oceans; the forty-one-and-a-quarter ton Boeing clipper, and the Sikorsky XPBS-1 "Flying Dreadnought," pride of the United States navy. And he was consulting test pilot on the Consolidated XPB 2Y-1 patrol bomber built for the navy.

Recently Allen has been



Top, Allen studying clipper's controls before attempting test flight. Center, Baby Clipper" which was test-flown by Allen. Bottom, Stratoliner on test hop with Allen at the controls

Sikorsky



busy with the new Boeing Stratoliner, the first airplane built commercially for carrying passengers at high altitudes.

Allen's flying days began during the world war when the United States government dispatched him to England to learn test flying from the British. Since then he has flown through the hair-raising boot-and-helmet days when feel of the seat underneath him took the place of instruments, to these days of slide-rule flying.

The test pilot's work, Allen tells you, begins before the first rivet is driven in the new airplane. When the projected plane is being laid out on the drafting board, Allen is called in for advice. He studies the de-

sign and offers suggestions as to making the plane more economical, useful and practical. He watches the material and workmanship that go into the plane after it leaves the engineers' drafting boards, helps with production problems in the factory as they affect construction of the plane and assists in selecting the proper instruments needed for the type and intended use of the airplane.

Then, when the plane is pushed from the hangar for its first flight, it is his job to fly it. And it is his neck that is to be broken if anything goes askew.

(Continued to
page 114A)



Top, another sky giant, the "Flying Drednought," which was tested by Eddie Allen. Bottom, gasoline trucks go to sea on barges to service the mighty Boeing clipper during test flights

Steel Rods Hung by 'Thumbs' in Rupture Test in Furnace



Engineer adjusts one of steel rods being subjected to breakdown test by weighted levers protruding from electric furnace

There are about 100,000,000 atoms clinging to each other along every inch of steel. If a thousand should slip or change position in an hour's time, the steel would eventually be badly distorted. It is to prevent this "creep" in steel that metallurgists are constantly hunting strong alloys and putting steel rods to severe tests which reveal expansions as small as a millionth of an inch per inch of steel. In one test of steel for turbines, the rods are placed in electric furnaces at temperatures around 1,200 degrees Fahrenheit and hung "by their thumbs" while a lever pull as high as 60,000 pounds per square inch is applied to their "toes." The rods are deliberately broken to learn their limit of strength. General Electric engineers also test various steel samples in electric furnaces at 1,200 degrees for a full ten years and then measure their creep and strength at the end of the period. Molybdenum, tung-

sten, nickel and chromium are alloys used to reduce distortion in steels that meet high temperatures in use. The high heat encountered in turbines may soften metal, and steel must be found which will not expand more than 1/100,000,000 inch per hour, and any changes must be symmetrical or the turbine shell might leak.

Airplanes Faster and Safer with Motors in Wings

Within the next few years airplane engines will disappear into the wings, and propellers will grow on long shafts. Army engineers predict immediate adoption of these two improvements in design and believe that they will permit higher top speeds, greater range, longer life and easier landings. Separate streamline housings cause too much drag, and building the engines in the wings may reduce the drag as much as one-fifth.

Self-Heating Food Can Cooks with Chemical

Food cans that carry their own heating plant make possible hot meals without a stove for the fac-



Left, closeup of self-heating can showing inner wall; chemical is sealed between walls. Right, serving hot food from can

Schenectady, N.Y.

Wright Field Dayton, Ohio

2-142

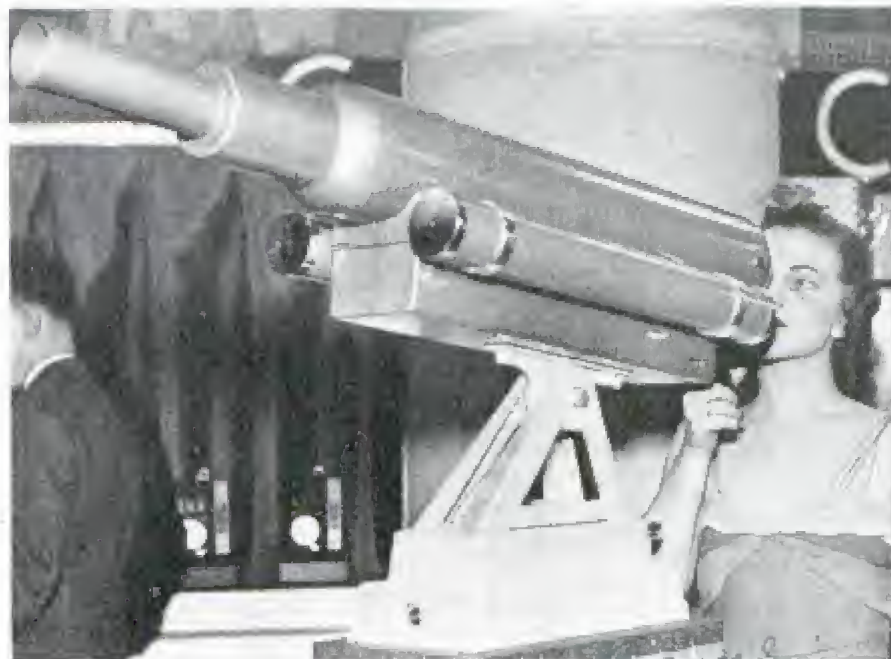
896

Beverly Hills, Calif.

W. Leg Katz

tory or field worker, hot picnic suppers when the firewood is wet or you've forgotten matches. The self-heating can, just invented, carries a chemical compound in a space between its double walls. When you want to warm the food in the inner can, punch four holes in the top of the outer casing. Air rushes in, and its action on the dry chemicals develops heat that will warm the contents within ten minutes. There is no danger of explosion or fire, and the chemical is odorless. The inventor expects the extra casing and the low-cost chemicals will add but one cent to the retail price of canned food, and he foresees wide use of the self-heating can in trailer travel, arctic exploration, and supplying food for armies and war refugees.

"Anti-Aircraft" Target Gun Fires Beams of Electricity



Drawing a bead on projected picture of airplane flitting across sky in "anti-aircraft" shooting gallery. Gun uses electric beams for bullets

Airplanes appearing to fly across the sky are "shot down" just for fun in a novel shooting gallery. The "anti-aircraft" gun, trained on planes that are flashed inside the drum by a movie projector, fires a pulsating electric beam at the target, and when hits are scored they are indicated by a meter.

Coin Machine Sells Insurance Policies Good for One Day



Accident insurance policies, good for twenty-four hours, are sold for a quarter by slot machine. You deposit the coin, write your name and that of the beneficiary, and press a lever to release the certificate. A duplicate policy is retained in the machine to prevent forgery. The machines will be installed in railway waiting rooms and similar public places.

More than 25,000,000 pounds of explosives were used in blasting tunnels of the 392-mile aqueduct carrying Colorado river water to Los Angeles.

Silent insurance salesman stamps time and date on policy that patron fills out after depositing a quarter. Right, accident insurance vendor

Bel
care

Esreal Northern Life & Co

Explosives Engineer

"Dudes" Pose on a Broncho but It's Only a Stuffed Pony



The pose may seem quite daring to the dude's friends back home, but the pony is stuffed, a "prop" of the photographer

Out in the dude-ranch country the tenderfoot tourists like to have their pictures taken riding a wild broncho. However, most of them can't stay in the saddle long enough for the shutter to click. An accommodating and enterprising roadside photographer in South Dakota fixed things up for the dudes. From a taxidermist he obtained a stuffed pony, mounted in bucking posture on a rail fence with a corral full of western ponies for realistic background, and the visitors climb into the comfortable saddle for a picture to send home.

Shells "See" Target in Air and Explode Near It

Shells used in anti-aircraft warfare are given "eyes" by the Bofors ordnance factory in Sweden, so they can "see" their target and burst when they approach it. In the nose of the shell is a cartridge of magnesium which burns brilliantly during flight and sends out long fingers of light through

radial openings in the shell casing. If some of these beams strike an airplane they are reflected back to the shell, where they are caught by photocells. These are connected electrically to operate the detonating mechanism. It is not necessary for the shell to make a direct hit to bring down a plane, since the concussion and the flying steel splinters ordinarily are enough to destroy it.

World Fair Model in Soap Carved with Kitchen Knife

On a three-foot square a Philadelphia man—radio cabinetmaker by trade and soap sculptor in his spare time—has laid out a scale model of the New York world's fair in which every tiny piece is carved from soap. It has taken him four months to shape and place the 500 pieces of soap comprising the finished model. The buildings are wired for lights, and each is painted according to the color scheme of the real fair. His tool was a small kitchen knife.



Sharpening up the "pylon" in a scale model of the New York world's fair hand-carved from soap. There are 500 pieces

MAGIC HANDS



Here are tricks to perform with your fingers. Practice makes them appear bewildering. Top, (left and right) stretching a finger: first, place left index finger on right index finger, then right second finger on top of left index fingernail, curling it around to hide joint. Keep both index fingers straight. Right (top to bottom) amputating a thumb: place left thumb with joint bent inward; then right thumb against left thumb, also with bend at first joint; next, right index finger hides gap of joint; finally, right thumb is slid back and forth along left index finger to get best effect



Left, jerking off thumb: left hand is stretched, then right hand grabs quickly at left thumb. Left thumb is placed down behind the hand against palm. Right fist next comes away with right thumb sticking out between second and third fingers. Thumb can be wiggled as though still alive, though apparently jerked off the hand



Sundial Tells Exact Minute When Adjusted for Date



Sun clock's crescent is adjustable for seasonal movement of sun so that it can tell exact time

By combining the ordinary sundial and the analemma, a sun clock that tells the exact time to the minute has been built. The analemma represents the path traced by the declination of the sun during a year. The sun shines through a hole in the upper arm of the metal crescent of the clock, falling on the analemma design on the lower arm. When the crescent is adjusted so that the sun spot falls on the current date on the analemma design, a pointer at the base of the crescent indicates the exact hour and minute. The clock is adjustable for any latitude and longitude.

Flashlight Battery Lasts a Year by Renewing Charge

Permanently sealed, a regular size flashlight battery, now on the market, can be recharged by a storage battery. The battery, which lasts about a year, can be



Flashlight equipped with rechargeable batteries. Special bracket makes contact with storage battery

charged daily or as required by placing it in a special bracket that is then attached to the battery. A rectifier permitting the use of house current for charging is available.

"Windows" in Bait Attract Fish by Flashing Light Below

Brightly colored artificial bait ordinarily reflects light upward and sidewise, but appears as a dark object from beneath. This deficiency is corrected in a metal lure which is fitted with unbreakable transparent "windows." In addition to reflecting light to the sides and above, the new bait transmits colored beams downward to attract fish lurking below.



Fiber Ring for Tuning Violins "Sings" When Pitch Is Right

Even without musical training you can tune a violin quickly and perfectly with the aid of a small tuning device that fits under the neck of the instrument. As each



Placing the tuning device in position for tuning. A novice could put violin in perfect pitch this way

string is keyed up, a fiber ring on a corresponding bar of metal inside the tuner vibrates in sympathy, indicating that correct pitch has been reached. The tuner is removed before starting to play.

Natives of India Hunt Fish in Clever Ways

Right, native of Malabar with crossbow, ancient weapon still used for fishing. Below, fishing with twin canoes. If fish are not caught in nets under boats, they try to escape by leaping from water and are trapped in the canoes

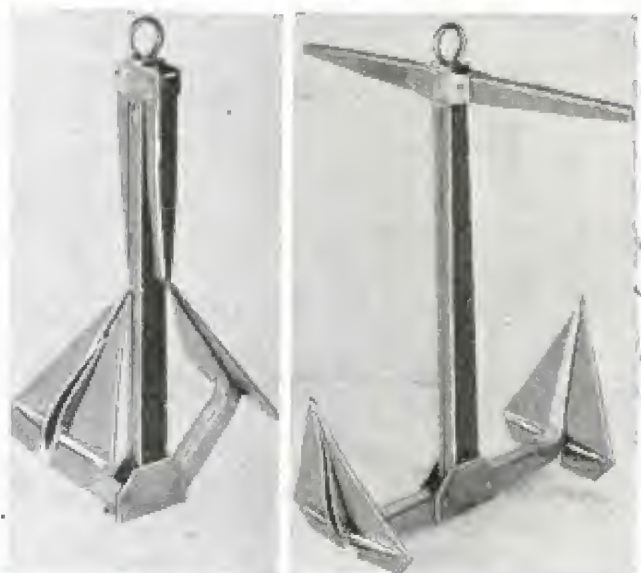


Harpoons and giant nets and casting rods may seem essential to the fishermen of the western world, but old-world peoples cling to the methods their ancestors used for centuries—and they seem to work. The natives of Malabar, India, still “hunt” fish with ancient crossbows, and trap them with

reed screens and trick canoes. One curious method is to harness two dugout canoes together and drag chains and nets in the water beneath. This frightens or traps the fish, and if they try to escape by leaping from the water they land in the boats or the nets stretched along their outer edges.

Folding Anchor of Light Metal Has High Holding Power

Made of lightweight welded metal, an anchor with folding arms has great holding power for each pound of weight. The eleven-pound size will hold a boat thirty-eight feet long, while the general rule is to allow one to two pounds in anchor weight for each foot of boat length. Its arms, equipped with a set of sharp-pointed triangular flukes, are pinned to the stock at right angles so they can be folded for stowing. The metal is resistant to corrosion and will not rust in fresh or salt water. Its light weight and small size permit ease of handling and reduce the danger of damage to hull and topsides. The anchor is available in a variety of sizes weighing from six to forty-seven pounds.



Stock and arms folded. Right, anchor open for use

Youngstown Welding and Engineering

Cable International Inc. 67 Wall St. New York

Safety Studio in Police Car Delivers Recorded Speech

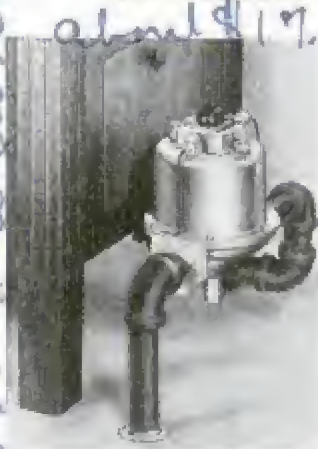
Plymouth 1939



Policeman speaking through microphone. Note cabinet on back seat with turntable for playing records

To reach more pedestrians and vehicle drivers with safety messages in the constant fight against accidents, police of Detroit, Mich., operate an automobile containing amplifiers and sound equipment for broadcasting recorded speech and music. A built-in cabinet for playing records fills half of the back seat, and loud speakers outside the car deliver educational lectures or music.

Pilot Flame Generates Current to Control Gas Heater



Heat from gas, without the help of batteries or other outside source of current, produces electricity to operate a heater valve as well as an electric-type thermostat. Power is developed by the thermocouple. To obtain automatic

heater control, a pilot burner generator is employed, which, in addition to serving as pilot flame for the burner of the heater itself, produces a constant flow of current. A threefold purpose is accomplished by the

pilot burner generator. It checks the pilot flame providing automatic control, supplies current for operation of the main valve, shown in the picture, and permits use of the thermostat. Failure of the pilot flame would cause the valve to close through inability of the generator to supply power. Mounted close to the floor level where it quickly responds to the colder air, the automatic control can be used to operate circulating heaters, gas radiators and range heaters.

g-139

Chef Delivers Dinners Hot on Rolling Steam Table

Meats and vegetables are brought piping hot to the tables in a Los Angeles restaurant, on a streamline aluminum steam table. The food is cooked in the kitchen, but is rolled right to the patron on this serving cart. Beneath the compartment for foods is a water vat, heated from below with a canned heating fluid. At the bottom is a storage compartment.



Chef serving dinner from aluminum steam table which is rolled direct to patron's table

*General Controls Co. Chicago
450 W. Adams St.
about \$17.00*

*Los Angeles
roadway
444
Stamler's
Hotel Supply Co.
Electronics*

CHALLENGERS of DISASTER

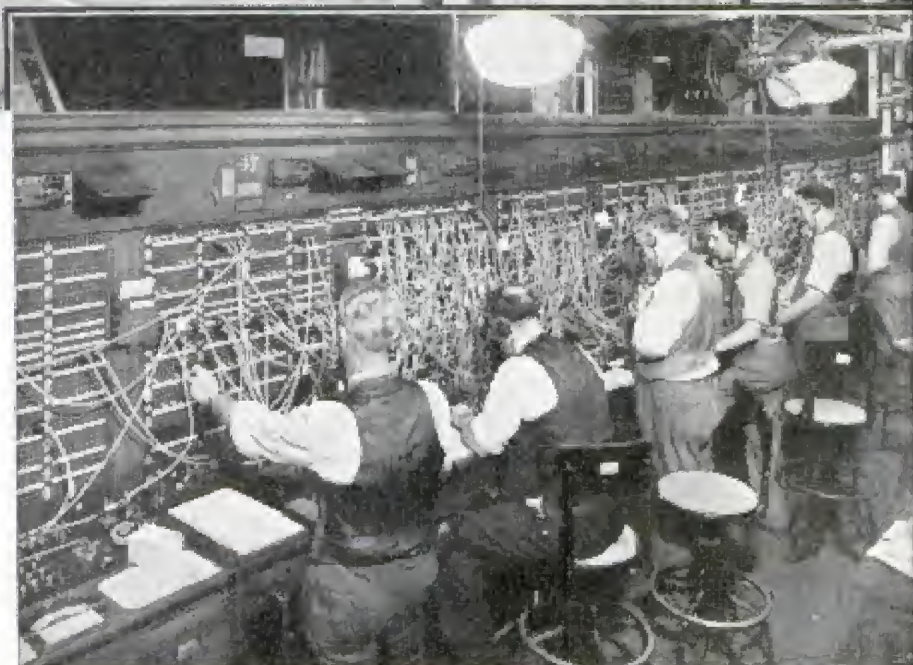
By *New York*
E. C. Schnurmacher

"PROVIDENCE calling Red Cross headquarters, Washington, D. C. Medical supplies urgently needed here. The hurricane has just struck."

"Westhampton, N. Y., calling the Coast Guard. Everything flooded. Send boats quickly for rescue work..."

"Hello, New York. Southern New England Telephone company calling. Tremendous hurricane damage in Connecticut. 100,000 telephones out. We need poles... cable... drop wire..."

Whether it be a hurricane, a flood, a fire or a tornado, after every disaster the shattered links in the country's vital nerve system, communication, must be restored



Top, resetting telephone poles after disaster. Bottom, test board showing "patches" that detour calls from damaged wires to those working

quickly. Telephone poles, uprooted by wind and water, must be replaced and damaged wires must be restrung.

Keeping the eighty-three million miles of telephone lines open in normal times is in itself a tremendous task for the 60,000 maintenance men of the Bell telephone

near highway Westhampton Bridge
mohawk highway
Quogue
Long Island City
32-64 Ave. N.Y.C.
New York
section



system. And when a catastrophe descends swiftly upon a section of the country, the job of replacement is not only increased a hundred-fold, but it must be speeded up as quickly as scientific equipment and skillfully directed human energy make possible.

Almost before the catastrophe has completed its first stunning blow, the challengers of disaster, men and women of the nation-wide system of the American Telephone and Telegraph company, are mobilizing their forces to restore communication so that the work of rescue may be expedited. As they take the field the huge supply plants of the Western Electric company begin readying the equipment which will be needed for replacement so that with the first messages from the stricken area, material will be dispatched speedily by truck, rail, plane and sometimes private cars.

"As soon as it became ap-



Top, traffic-control bureau which keeps track of "re-routes" around stricken areas. Center, Pittsburgh worker on job in Connecticut. Bottom, string of telephone poles in New England damaged by the wind. Thousands of poles were in this condition after the disaster

parent that the recent New England storm was developing into a hurricane, cutting a swath of death and destruction through eight states, operators off duty and those on leave returned to their central offices, reported, took places at the switchboards—all as a matter of course," said an official of the American Telephone and Telegraph company.

"Whether it was an operator heroically putting through her calls in a small Rhode Island town, a maintenance man hauling himself by rope across a raging Connecticut torrent to string an emergency telephone wire, or a fleet of repair men from the west, driving into the stricken area and literally making their own roads as they did so, the challengers of disaster met their greatest test in the New England hurricane.

"Former operators vol-

Lynne

unteered everywhere, were welcomed and put to work. Plant forces knew no hours. Beside them worked commercial employes, salesmen, business office representatives, anyone who could be of help. Engineers took to the field with the plant crews. Paymasters with cash in hand set up offices at central locations. Men from the accounting department went out to relieve foremen and supervisors of time-consuming details. Many a subscriber was startled by a masculine response to a request for "information!"

When the Connecticut river rose to its highest crest on record, in 1936, water filled the basements of the two main telephone buildings in Hartford, Conn., and flooded the first floor of one to a depth of several feet. Batteries and associated power equipment were drowned and telephone service in much of the city was disrupted for several hours.

The engineers moved the power plant upstairs, reinforced and waterproofed the basements of the buildings and built removable watertight bulkheads for all the

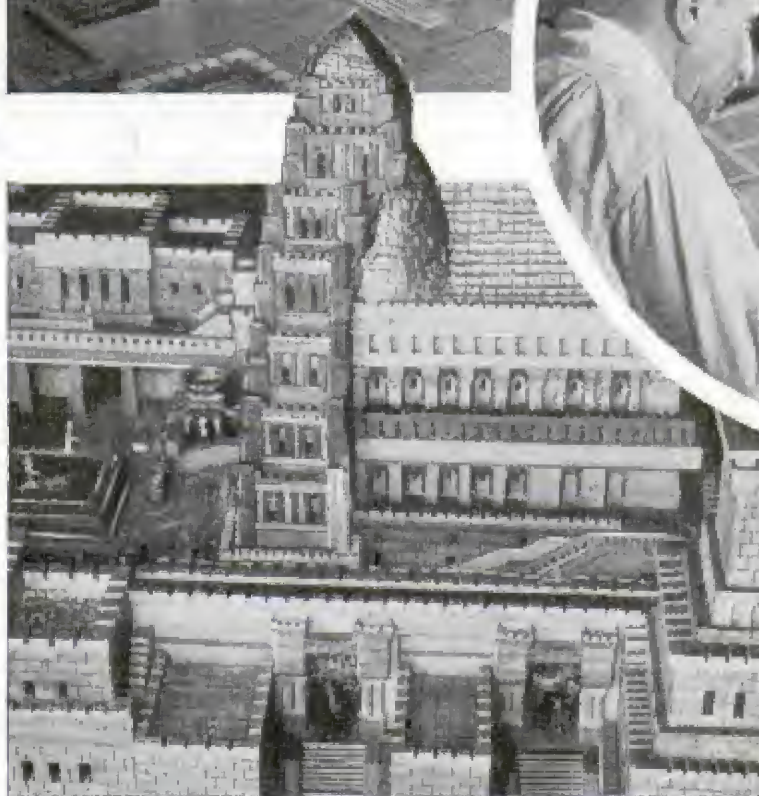
(Continued to page 118A)



Top, New Jersey telephone men preparing to string a new cable at Mystic, Conn.; one, riding the wire, is placing rings to support the cable. Bottom, group of Illinois Bell Telephone company aerial cable tower trucks lined up at freight depot, waiting to be loaded on special trains for shipment to stricken area. These are some of the forty-three pieces of motor equipment rushed into the hurricane zone from Illinois to aid in reconstructing lines

Model of Solomon's Temple Is Built to Scale

Ancient literature guided a Brooklyn scholar in building a plaster model of Solomon's temple. The project took him two years, and was done with the utmost faithfulness to detail. Accurate in scale, it covers 125 square feet. The builder is a schoolteacher and student of religion.



Three views of plaster model of Solomon's temple, constructed over two-year period by a Brooklyn schoolteacher and student of religion. In circle, the builder is shown checking dimensions of the model with ancient literature

Plastics Made from Coffee for Wallboard and Insulation

Since the world doesn't drink all the coffee it produces, chemists have found a way to dispose of the surplus by turning coffee beans into plastics. South Americans may soon build homes with roofs and floors of coffee, insulating and acoustical wallboard of coffee, and even electrical fixtures and radio parts made of coffee plastic, which is a non-conductor of elec-

tricity. These plastics, now in the experimental stage, are made from unroasted beans and are therefore odorless. They can be produced in almost any color and any stage of translucency or opacity except pure transparency, and little has to be added in the manufacturing. The bean itself furnishes the dyes, the bulk material and plasticizers. Furthermore, it is ex-

Developed by H. S. Robin (Robin)

Business Week. 2-165
1/22/37

pected that the process will offer valuable by-products such as an oil similar to linseed, a fertilizer, vitamin D, vegetable dyes and caffeine. At present there is an annual surplus of about 4,000,000 bags of coffee in South America. It is contemplated that coffee plastics would be manufactured only for use in South America.

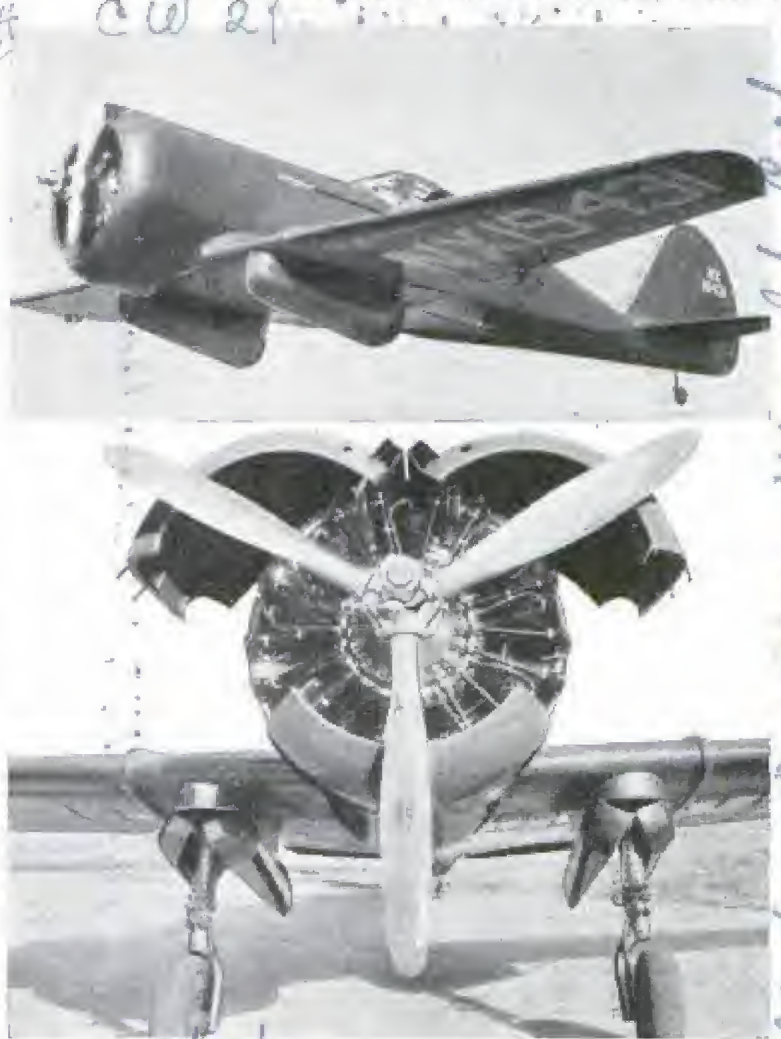
"Blinks" Counted in Test to Show Eye Fatigue

Close measurement of the degree of human fatigue produced by visual tasks under various lighting conditions, is obtained by a "comfort meter" which determines the frequency of blinking. Results of the tests are being applied by General Electric research laboratories as a more exact means for finding the proper quality, brightness and distribution of light. Blinking increases proportionately as visual discomfort becomes greater. A complicated device records the number of blinks per minute. Tiny electrodes touching the skin near the eye pick up electrical currents generated in the blinking process. These currents are amplified millions of times and, finally, two pencils of light draw a graphic record of the frequency and nature of the blinks.



Subject in right foreground reads while complicated apparatus behind him counts "blinking rate" to determine eye fatigue

'Mosquito' Plane Climbs Mile in a Minute and One-Half



Notice how the landing gear of this fast climber retracts into streamline housing with folding hoods

Small but carrying plenty of "sting," a fighting plane that climbs nearly a mile in a minute and a half is trying out for an army job chasing bombers.

This trim little speedster can be up in the sky training its twin machine guns on the enemy within three minutes after an invading bomber is reported. It climbs 5,000 feet in the first ninety-six seconds, reaches 10,000 feet in two minutes forty-eight seconds, 15,000 feet in four minutes twelve seconds, and is up 20,000 feet in less than six minutes. Capable of 300 miles an hour at 17,500 feet, the ship can cruise at 35,000 feet with its two-speed supercharger and oxygen supply for the pilot. It is called an "interceptor fighter." Landing wheels retract into a streamline housing with a folding hood.

Wela Park Cleveland Ohio

Quilt by S. C. Dierks. Wm. H. C. Co. 300 Rockefellers Plaza

Mr. Matthew Luchess

Powered Dustpan and Brush Sweeps Close to Walls

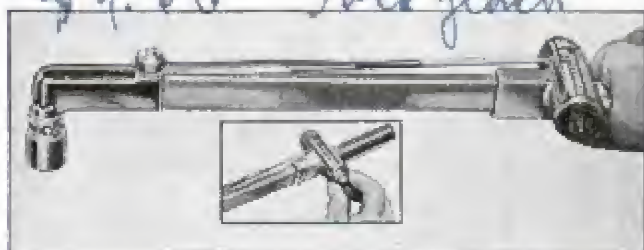


Operator rides along to steer dustpan. Pressure of broom on floor is fixed and always remains the same

Driven by a one-horsepower motor, a dustpan and broom picks up dirt, from tiny particles to stones the size of a hen's egg, while traveling at about three miles an hour. Although it is seventy-two inches long, the sweeper can be turned around by hand in an aisle sixty inches wide. Cleaning either factory floors or city streets, the broom, which can be made of flexible fiber or stiff wire, will lift refuse an inch and one-half from a wall.

Tension Wrench Flashes Light to Indicate Proper Pull

For precise control of tension when working on delicately adjusted bearings, thin-walled cylinder blocks and clutch assemblies, a wrench is provided with a sig-



Turn of knob, as shown in inset, exposes scale and pointer is set to recommended tension

nal light that flashes at the instant the required tension is reached. A finger turn of its control knob brings into view various scales showing inch-pounds, foot-pounds, and recommended pulls for spark plugs and bolts. Then the pointer is set to the recommended pull, tension is applied and the flash tells when to stop adding pressure.

Dummy Airplane Cockpit Shows How Ship Is Controlled

Complete with radio equipment and all flying instruments, a mock-up, or dummy of a pilot's cabin constructed by one of the large air lines, dramatizes the work of the pilot and depicts safety features of transport planes. Here the public can see the instruments that give a complete picture of the flight and make it possible to navigate the ship through inclement weather, and others which keep a record of how the motors are operating. The radio equipment consists of a short-wave transmitter and three short-wave receivers. By adjusting



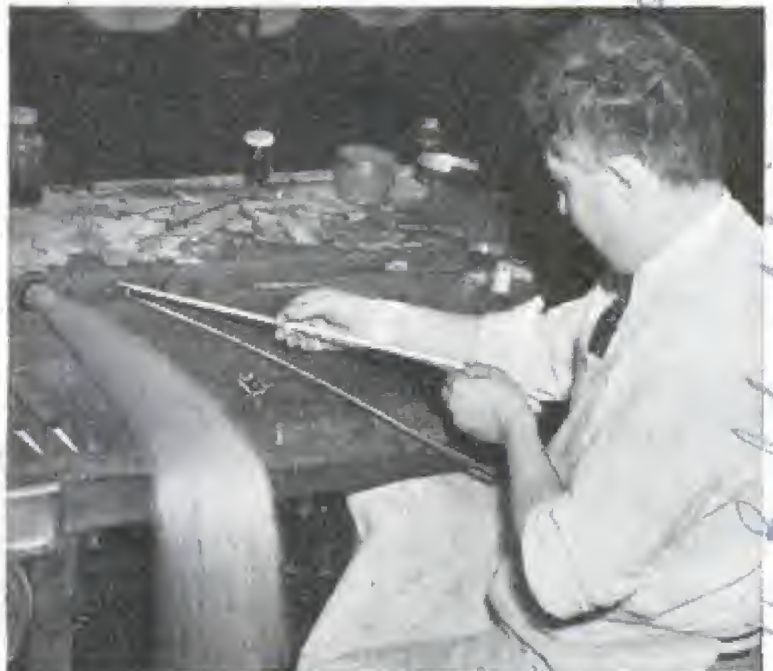
Airplane instruments and controls are exhibited by "dummy" so public may see safety features of flying

controls located above the cabin windows the pilot can tune in on the radio beam, the radio marker signals, or the company two-way radio stations along the air lane. Also included in the replica are controls for adjusting the ship for flight under various load conditions and for regulating the mixture of gas and air in the motors.

Flame-Tempering Violin Bows for Resiliency

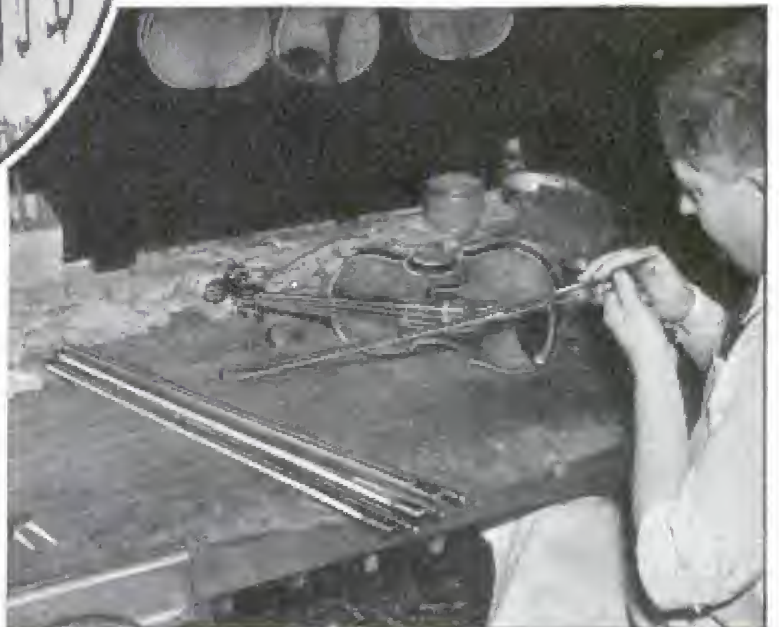


Above, violin bows are first sawed from block of brazilwood, then worked into shape with a file since this wood is too hard for cutting tools. Top, right, placing hairs on the tempered bow. Specially selected horsehair is obtained in bunches as shown, and a bow requires 100 to 110 hairs



Above, bowmaker watches process closely while tempering "stick" of brazilwood over flame. It is heated at certain places to an exact temperature to set up stresses in fiber for proper resiliency. Left, collection of bows from which concert violinist matches a bow to his instrument. Bottom, as a final inspection of bow, maker presses it against bench as shown and notes "comeback"

One of the secrets of the violinmaker's trade is the method of obtaining resilient bows from such dense, heavy woods as brazilwood, snakewood and ironwood. Actually this wood is tempered over a flame. Accurate heat treatment sets up stresses causing the fibers to tighten up in certain places. Later, as the bow is used, the fibers lapse into their original forms and the bow must be retempered. If this is done by a skilled bowmaker, repetition of the tempering process improves the wood each time. Experts believe that "tuning" violin bows with fire is the only instance of flame-tempering wood in industry



Cent. George W. Eckhardt Co.
204 W. N. Park Ave. Phila

H 15 69
 R.A. Langbey,
 near Sunnyvale
 Jeanette
 Smulley
 Corinne Felice
 "BATH TUB"



Above, showing how vegetables grow in hydroponics garden. Left, Dr. Gericke with tobacco plants grown without soil



785 By Frank J. Taylor

SCARCELY five years have slipped by since word leaked out that Dr. William F. Gericke of the University of California had discovered a sensational method of growing vegetables and flowers without the use of soil. Within that brief span, hydroponics—"labor of water," as this brilliant professor called his new method of feeding plants—has caught the popular fancy as has no other scientific development of recent years.

Literally by the bale, letters have poured into the university asking for instructions on how to mix the mysterious plant nutrients. Farmers, nurserymen, greenhouse growers, amateur gardeners and indoor "bathtub horticulturalists" tackled the new way of growing plants with enthusiasm.

San Francisco Calif

GARDENING"

When his neighbors first peered over the back fence at Berkeley to gaze in amazement at tomato plants so tall he had to pick the fruit from a step ladder, Dr. Gericke refused to reveal his mysterious formula for liquid farming. He contended that hydroponics was a complicated chemical process, too difficult for the amateur to master and too new for the average person to try until it had been tested in every way. The professor was upset because commercial concerns sprang up to capitalize upon the public's curiosity and sell nutrient salts costing as lit-

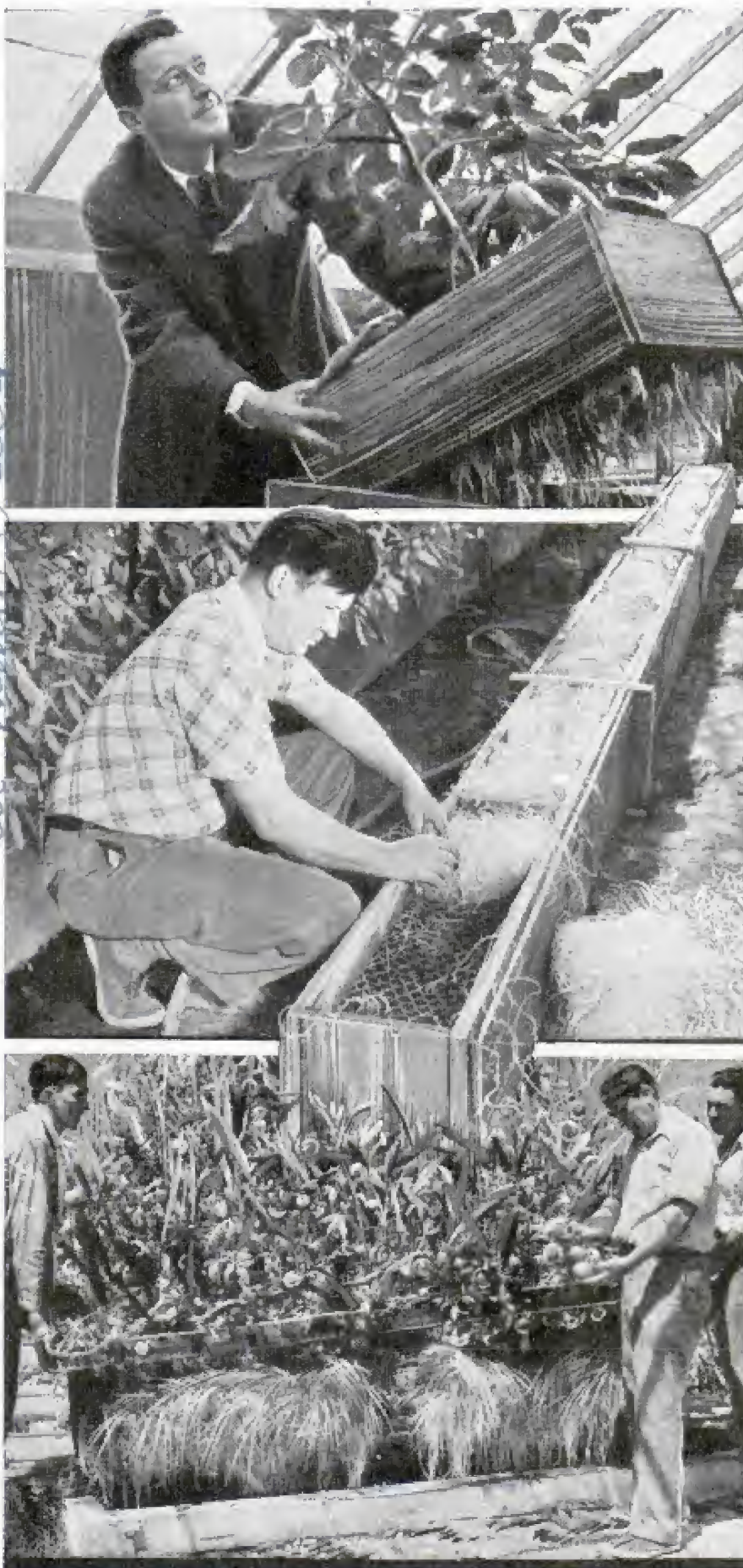
Right, tomatoes grown by hydroponics method. Below, examining roots of tomato plants



al Monte Belli



Ernest Brundin



Top, Rolland Langley exhibits root system of dahlia in blossom in mid-winter. Center, preparing seed bed of excelsior and rice hulls over a tank. Bottom, lifting seed bed of a tomato planting to inspect root growth in the plant nutrient

tle as four cents a pound for as much as two dollars, with inadequate instructions for using them.

Since Dr. Gericke refused to reveal his secrets, the university authorities, bombarded by inquiries from everywhere, felt it their obligation to tell what they knew, since theirs was a state institution supported by the taxpayers. They assigned two other scientists, Dr. D. R. Hoagland and Dr. D. I. Arnon, to parallel the Gericke experiments, test the various formulas, and publish a report, which was made available to the public. In the last two years, repeated printings of this report have been exhausted.

That hydroponics has definite commercial possibilities has been demonstrated. Pan-American Airways, which operates the trans-Pacific clipper ship route from San Francisco to Hong Kong, encountered a peculiar horticultural problem on Wake Island, an important base in the trans-Pacific chain. Wake is a low, sandy atoll, with so little soil that only scrubby desert plants can maintain life on it. The company maintains not only a base, but the Airways Inn, on the isle. The problem of supplying fresh vegetables and fruit was acute, because the supply vessel came but twice a year, and cargo space in the clippers was entirely too expensive for crates of fresh produce. Pan-American Airways officials appealed to Dr. Gericke, who had con-

Ernest Brundin
at winter Dell

Brundin farm
Cali

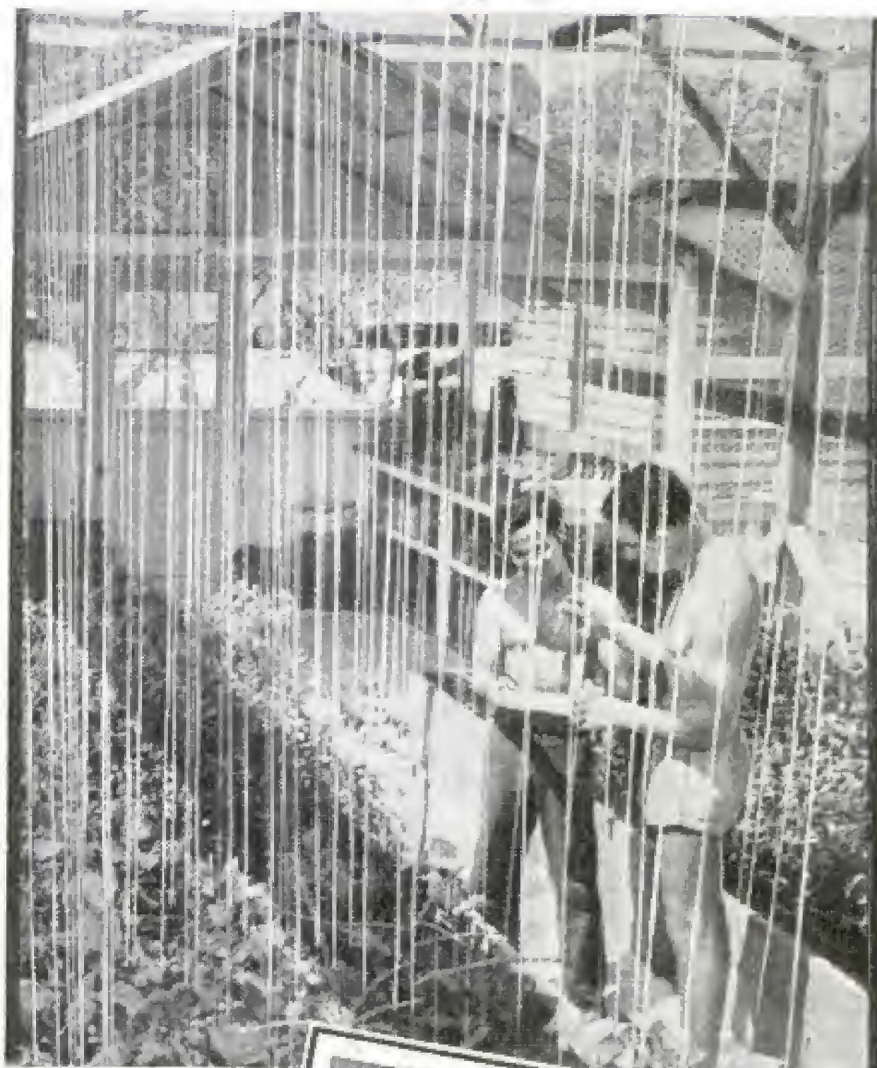
tended from the start that hydroponics farms would be most successful in the deserts, where sunshine is at a maximum and pests are reduced to the minimum, and where water is scarce. Curiously enough, chemical culture takes far less moisture than agriculture.

FREE FORMULAS

Tested formulas for mixing tank garden plant foods may be obtained free by enclosing stamped, self-addressed envelope with your request to Popular Mechanics' Bureau of Information

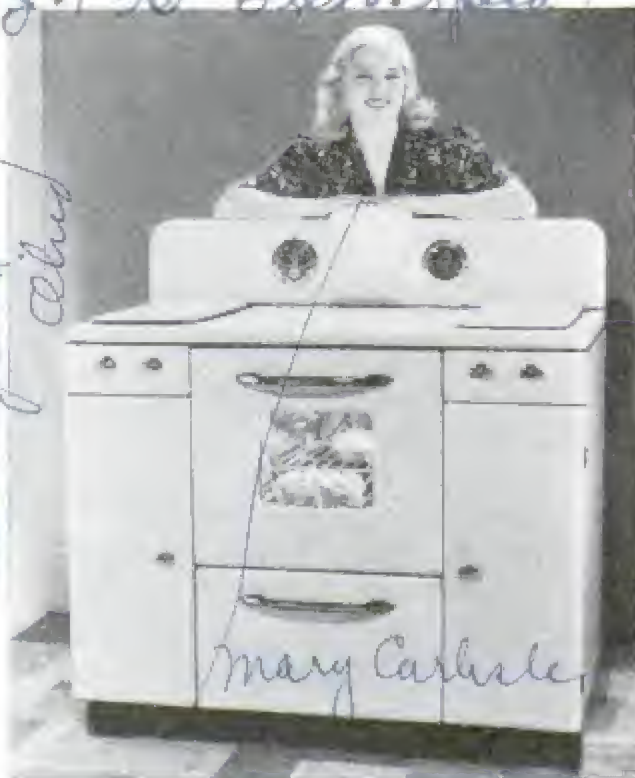
Dr. Gericke dispatched one of his students, Lamory Laumeister, to Wake to lay out the first model commercial outdoors hydroponics garden. Within two weeks after his arrival, Laumeister had his tanks built, the seeds carefully planted in the moist excelsior and peat that rested on the wire nettings above the nutrient solution. In the brilliant, warm mid-Pacific sun-

(Continued to page 128A)



Top, "bathtub gardens" on Wake Island. Center, feeding nutrient salts into sump. Bottom, hydroponics-grown potatoes

Window and Light in Oven Allow Inspection of Food



Biscuits bake in plain view in this windowed oven and there's no need for opening the door to check

Through a Pyrex window in the oven of one of the latest model stoves, the housewife can watch her turkey, cake or biscuits turn a perfect brown. No need to open the door for inspection, and thus lose oven heat and warm up the kitchen. The food is always visible, and there is a twenty-five watt electric light in the oven.

Electric Buzzer on Typewriter Warns of End of Paper

An electric buzzer signals "end of the paper" on one of the latest model type-



Adjustable cradle in back of typewriter contacts band in roller and signals when end of paper is near

writers. A countersunk contact band girdles one edge of the roller, and beneath the roller, at the back, is an adjustable cradle that makes contact with the band when anywhere from one to ten lines remain on the paper. This sounds the buzzer, which is inclosed in a case with a small battery.

Barrier Encircles Floating Oil and Stops Water Pollution

Oil discharged into harbor waters has always been a bane to fisheries and unpleasant to bathers. At some ports oil companies and vegetable-oil plant owners have been fined heavily for such oil "spills," and in order to meet anti-pollution laws a San Pedro, Calif., sailmaker has developed a floating barrier which encircles the pool of oil to facilitate removal. The boom is made of leakproof cork-filled sections 120 feet long, covered with asbestos, and two or three sections comprise an average-size barrier. When an oil leak is dis-



Top, placing snakelike barrier on water to retain spilled oil. Bottom, view of cork-filled section

covered, whether from plant or ship, the flexible boom prevents spreading by enclosing the spot. Men in boats then sprinkle sawdust or shavings on the surface, later "mopping up" the oil-soaked shavings and taking them ashore. Enforcement officers of both health departments and marine fisheries have approved this oil-retention device as an adequate means for protecting harbor and beach waters. It can be used for many years before it requires cleaning, and this is done with a simple solvent.

Clark Becker
7665 Wilcox
San Pedro, Calif.

Camera Snaps Eye in Color or Makes Copies

Life-size or magnified photographs of the eye, in color or black and white, can be made for clinical purposes with a camera and synchronized lighting assembly recently developed. With special attach-

Right, camera in position to photograph eye of patient. Left, note minimized reflection in enlarged photo of eye. Bottom, copying page of book. Lens is focused with ground-glass tube which swings out of way when picture is made



ments it is adaptable for copying pictures and postage stamps, making partial face photos, and for fitting to microscopes. Magnifications of the eye are obtained with interchangeable lens extension tubes. The lamps, mounted to left and right of the camera, have clear instead of frosted glass to reduce reflection of light from the cornea. If only one light is needed the other may be cut out. A special two-way resistance keeps the lamps burning at low intensity to relieve the patient of any strain while focusing, and the synchronizing shutter switch causes the current to bypass the resistance, throwing full voltage into the photoflood bulbs. The switch can be set to give full brilliancy at the time of exposure. Subjects are brought in focus with a ground-glass tube; then the camera, which is hinged to the stand, is swung up-

ward into contact with the lens. As the unit is simple in operation, an inexperienced person can photograph cases with little or no assistance. To adapt it for copy work, the camera is lifted out of the upright post and a "T" connection slipped into its place. This holds the camera arm in a horizontal position with the lens pointed downward toward the book or picture that is to be copied.

Electric Shaker Mixes Paint to 'Condition' It for Use



Clamped on the electric vibrator, the can of paint is given a vigorous shaking to prepare it for use.

Paint stores and workshops are using an electric vibrator to mix paint for use. Any standard can from a half-pint to a gallon will fit the shaker. After clamping the can in place, the current is turned on and the can is shaken up and down and sideways 675 times per minute. The paint "conditioner" is fastened to the floor, rubber shock absorbers preventing vibrations.

Four-Inch "Rumba" Radio Wave Handled Like Light Beam

Revolutionary changes in radio transmission may result from the development of a "rumbatron" transmitter that emanates powerful waves controlled almost as easily as a searchlight beam. These waves, less than four inches long—commercial aircraft use a wave of nearly forty inches—can be concentrated and reflected, and the Stanford University scientists who developed the rumbatron believe that many waves could be shot simultaneously through a metal tube carrying a multitude of telephone conversations or telegraphic messages. A single narrow wave could be used to guide airplane pilots to blind landings, or harnessed to an altimeter to tell a

pilot by reflection his exact distance above earth. The instrument is based on the fact that an electric field influences the speed of electrons. An electron stream from a cathode tube is run parallel to the lines of force in an electric field, and as the field speeds up the slower electrons and slows down the faster ones, the electrons aline themselves in waves with spaces between. These electron bunches pass into a tank containing a high-frequency current. The current picks up energy from the electron bunches and bombards a metal plate three billion or more times every second to produce the ultra-short wave. The rhythmic darting of electrons suggested the "rumba" dance, and when a Greek professor reported "rhumba" was Greek for rhythm in motion, the nickname "rumbatron" was given the new radio instrument.

Portable Reflecting Telescope Fits into Shoulder Case

You can spot the time on a watch a quarter of a mile distant with a powerful four-and-one-half inch reflecting telescope that fits, with its folding tripod, into a handy case carried on the shoulder. This lightweight telescope, weighing but twenty-three pounds, has an aluminized mirror, and eyepieces up to eighty power.



Portable telescope is shown in its shoulder case and set up on folding tripod.

736

POPULAR MECHANICS

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Portable telescope is shown in its shoulder case and set up on folding tripod

736
90
Patented by
Russell & Varian, Research Associates
and signed
P. Varian
Layton P. Smith, Jr.
Washington, D.C.
40 Flatfish Ave
Brooklyn, N.Y.
215-8 Sepulveda Blvd.
West Los Angeles, Calif.
New York Times 7/20/39
Esuffith Telescope



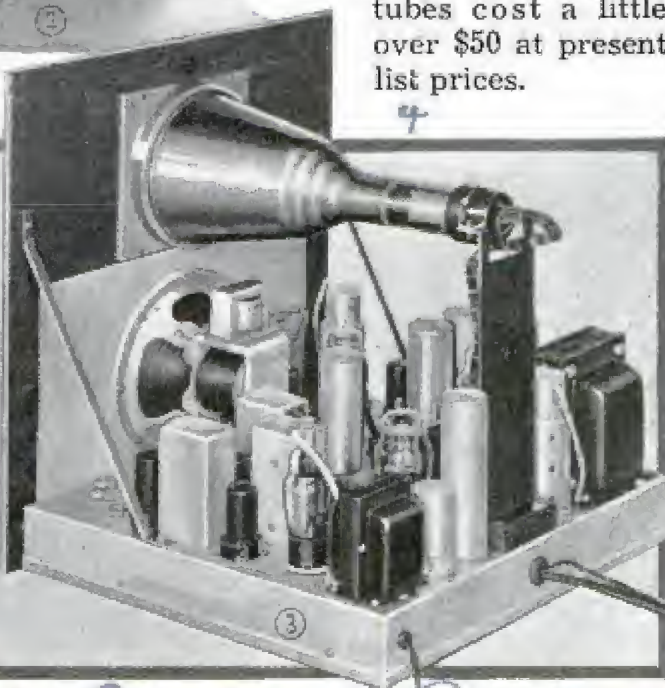
Sight and Sound RECEIVERS

TABLE model television receivers designed for reception of experimental sight and sound programs from the New York television stations operating in the metropolitan area, are now available in both kit and complete form, as illustrated in the accompanying photos.

The compact instrument in Figs. 1 and 2 has 21 tubes; the cathode-ray tube has a diameter of 14 in. and the black and white television image measures a full 8 by 10 in. Synchronized sound of the broadcast issues from the speaker grille below; it is claimed that a dozen persons can comfortably follow the visual program. This model sells for about \$395 complete with tubes.



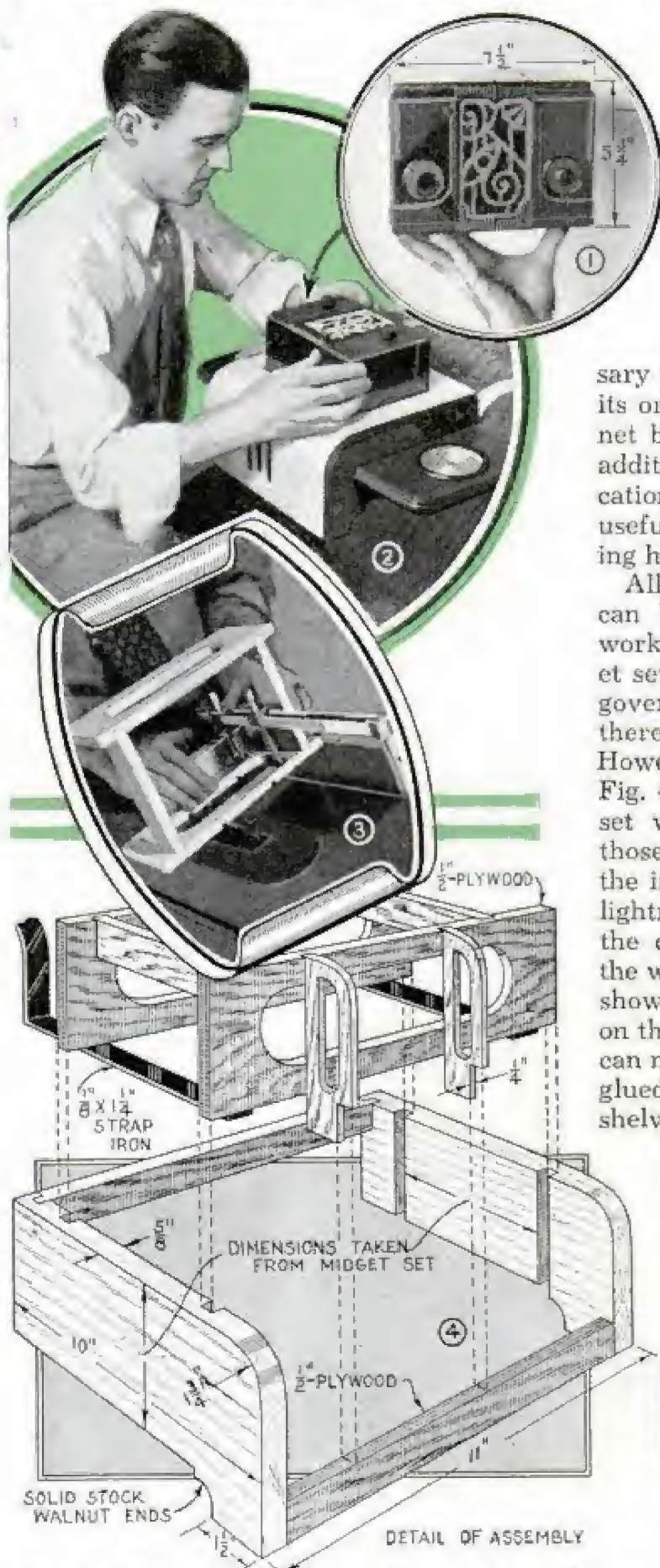
Photos Figs. 3 and 4 are front and rear views of a well designed kit assembly available to experimenters and service men who wish to build their own instrument at minimum cost. It is a 16-tube unit and the picture tube is a 5-in. type. The kit includes the front panel, chassis and all parts, except tubes, for about \$80; the complete set of tubes cost a little over \$50 at present list prices.



3 and 4 Andrew Radio Corp.
111 and 113 E. 1st St. N.Y.C.

1 and 2 Allen B. Blumstein are
Laboratory, 2. main are

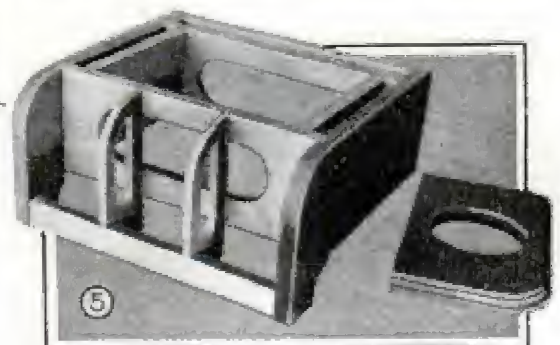
"On-a-Chair" CABINET



HANGING conveniently on the arm of your easy chair, this simple cabinet arrangement serves several useful purposes. Almost any standard midget receiver, of the type shown in photos Figs. 1 and 2, can be installed in the radio-housing compartment in a position where all of the set controls may be adjusted with ease. It is not even neces-

sary to remove the receiver chassis from its original cabinet, in fact, the set cabinet becomes a part of the assembly. In addition to providing a handy tuning location for the receiver, it also includes a useful ash well and a convenient mounting hole for an electric clock.

All materials are inexpensive and you can build the cabinet in your home workshop. The over-all size of the midget set that you happen to have on hand governs the size of the chair cabinet and therefore it must be built accordingly. However, the general dimensions given in Fig. 4 will take care of the average size set with over-all measurements near those given in Fig. 1. Plywood is used for the inner parts of the assembly since its lightness will tend to keep the weight of the cabinet to a minimum. Jig-sawing the waste from the center of the pieces as shown will also help. Joints may be cut on the saw as illustrated in Fig. 3, or you can merely use plain, butt joints securely glued and nailed. The exposed ends and shelves of the cabinet should be made of fine cabinet wood such as walnut. Fig. 5 clearly shows how the assembly will look at this stage when glued together. Care must be taken



for your MIDGET SET has built-in ash well and clock . . .

to allow ample clearance in the frame so that the little receiver will slip in freely.

You are now ready to cover the top of the framework in the manner illustrated in Fig. 7. For this covering you will require a sheet of $\frac{1}{20}$ -in. thick wood veneer. If you wish to finish this bone white, which contrasts nicely as shown in photo Fig. 6, a cheap grade of birch stock can be used for a paint job, or, if you prefer an all walnut finish, select a nicely grained piece of walnut veneer. Please note that the grain should run lengthwise so that the veneer will bend over easily at the front. The veneer sheet should be a little oversize so that it can be trimmed flush with the edges of the cabinet; the small grille slots must, of course, be cut before applying the veneer. Several clamps, or heavy weights, may be used to press it firmly while the glue is drying. When dry, the veneer covering the center well of the cabinet is cut out. The extending shelves which support the ash container and clock may be fastened in place with either short dowel pins or wood screws. If proper equipment is not available for shaping the outer

(Continued to page 138A)



Three-Unit Broadcast Receiver for Beginners

PART II

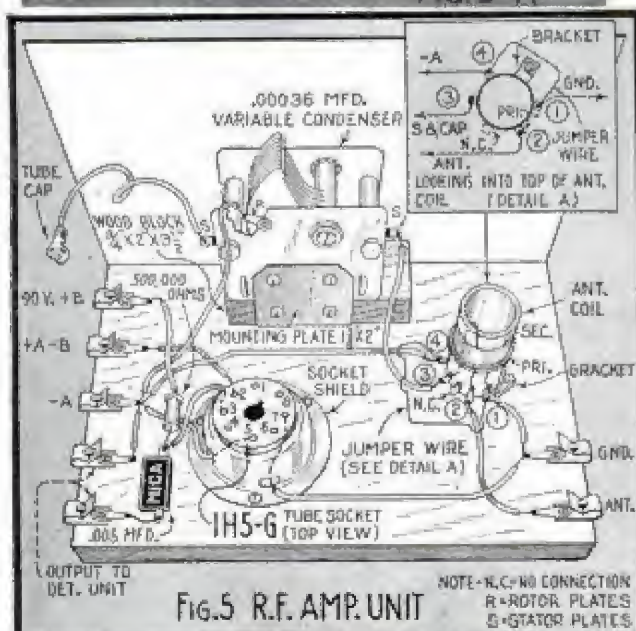
AFTER completing the detector and audio-amplifier units described in the April issue, most builders will wish to add the r.f. amplifier unit which provides sharper tuning and extends the range to include distant stations.

No additional batteries are required to operate the r.f. stage to be described, and no changes are necessary in the wiring of the first two units.

This r.f. stage is merely connected to the unused clips that were wired into the detector circuit and arranged along the right-hand side of the base of that unit, as will be noted by referring to the simplified wiring diagram Fig. 2 in Part I. The antenna and ground wires are shifted from the detector unit to similar clips mounted on the r.f. unit base; short jumper wires are then used to connect all remaining clips on both stages.

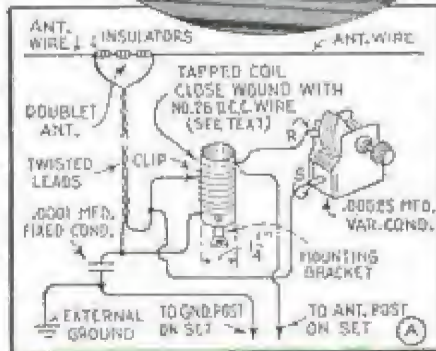
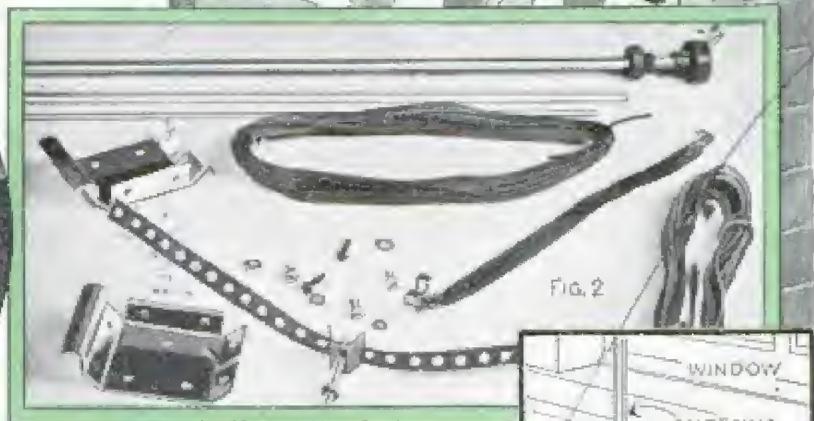
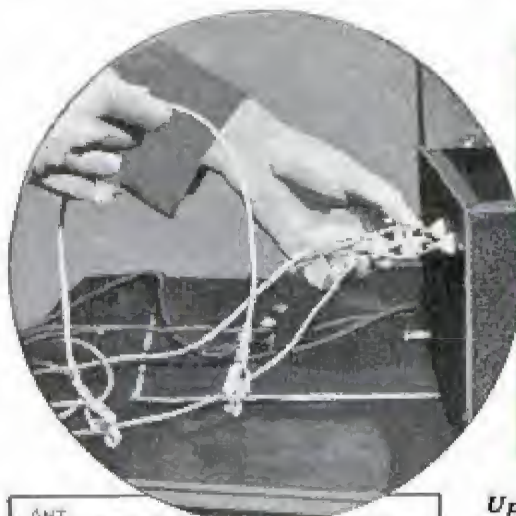
A simplified wiring diagram of the r.f. amplifier appears in Fig. 5 and the schematic circuit diagram is given in Fig. 6. A type 1H5-G tube is also employed in this stage and the same kind of variable condenser as used in the detector. The panel and baseboard dimensions are identical with those given for the previous units. All wiring details are clearly shown in Fig. 5 and the parts should be arranged just as indicated, for best results. Care must be taken when soldering the leads to the prongs on the underside of the tube socket that each connection is made to the proper

(Continued to page 136A)



PRACTICAL RADIO HINTS

Rod antenna eliminates all overhead wires, requires little space and is easy to erect. It may be attached to a vent pipe on the roof as illustrated in Fig. 1, or it can be mounted on a flat surface near a window in the manner shown in Fig. 3. A lightning arrester is built into the 3-section aluminum rod; the total length when assembled is 12 ft. All necessary parts are included in the kit which appears in photo Fig. 2. When mounted on the iron vent pipe no ground is necessary; if installed as shown in Fig. 3, a ground wire is employed



Upper left, battery clips connected to short lengths of flexible rubber-covered wire save time and trouble at the radio workbench. Instead of soldering temporary leads, these connectors serve to add filter condensers in power supply unit, or make battery, antenna and similar connections

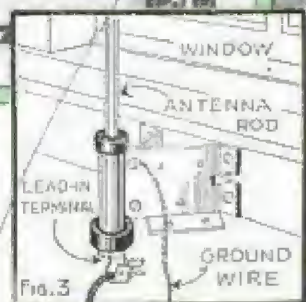
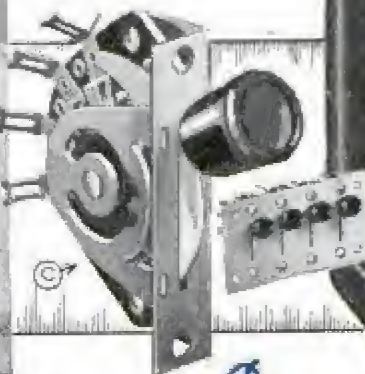


Diagram "A" shows method for using doublet antenna with older model sets. Coil should have slightly fewer turns than first grid coil in receiver; taps along coil permit experimenting to find best reception point. Assemble parts on small board inside or outside cabinet

Below, "B," complete course of six radio code lessons now available on three records; "C," lever-action toggle switch for single or gang assembly; Right, long-life A-battery for 1.4-volt tubes



Centerlab Co. 900 E. Main St. New York
National Carbon Co. 42nd St. New York

Ralston Record Co. 2138 N. Racine Ave. Chicago

Radio Printer for Experimenters



You can assemble the printer section of this facsimile receiver from a kit listing for about \$49, and operate it with your own broadcast receiver, if you have one which has 5-watt output and automatic volume control. The standard wired model illustrated is mounted on a 7-tube receiver specially designed for switching quickly from sound programs to printed news and pictures. This set can be used to demonstrate facsimile printing from phonograph records with a suitable record player. At present thirteen stations are equipped to transmit experimental programs.

Sensitive Telephone-Type Relay

Speedy and highly sensitive, this compact d.c. relay is now available for experimental and educational applications in



plate circuits of electronic tubes for remote-control, signaling, communication and similar uses.

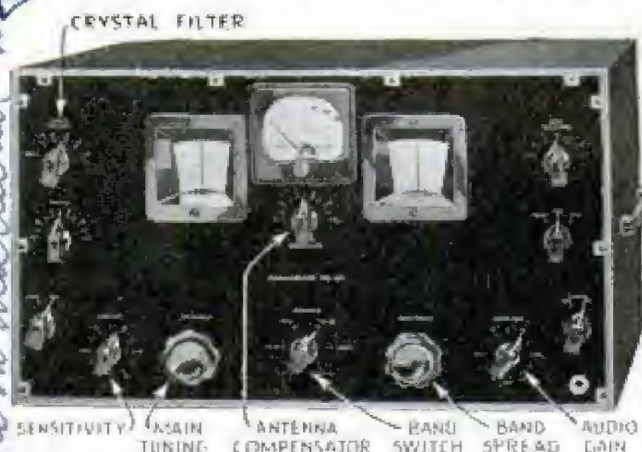
Automatic A-B Power Supply

Working on a 6-volt storage battery, wind charger, or any 6-volt source of d.c. power, this unit operates directly and automatically by means of the switch on the front of your receiver. It replaces 2-volt dry or wet "A" batteries and all of the "B" batteries on 1½ or 2-volt receivers.



Short-Wave Set Has Noise Limiter

This 12-tube receiver has a tuning range from 540 kilocycles to 31 megacycles, covered in 6 bands. Outstanding features include an efficient noise limiter which fol-



lows automatic volume control for quiet reception; antenna compensating control for maximum signal-to-noise ratio; 310 degrees band spread and crystal filter.

Blueprints covering radio construction articles in this and past issues are available for 25 cents each. Original material lists, with names of manufacturers and dealers, can be obtained from our Radio Department upon receipt of postage.

NEXT MONTH—How to Build a Three-Tube A.C.-D.C. Pillow-Speaker Receiver. A pillow-speaker unit takes the place of the usual loud speaker or head phones in this inexpensive little set which is designed for "quiet" or personal-receiver use in homes or hospitals. Also, **Portable Crystal Set That Fits Your Pocket**



Wheeled LOUNGE *in the Garden*

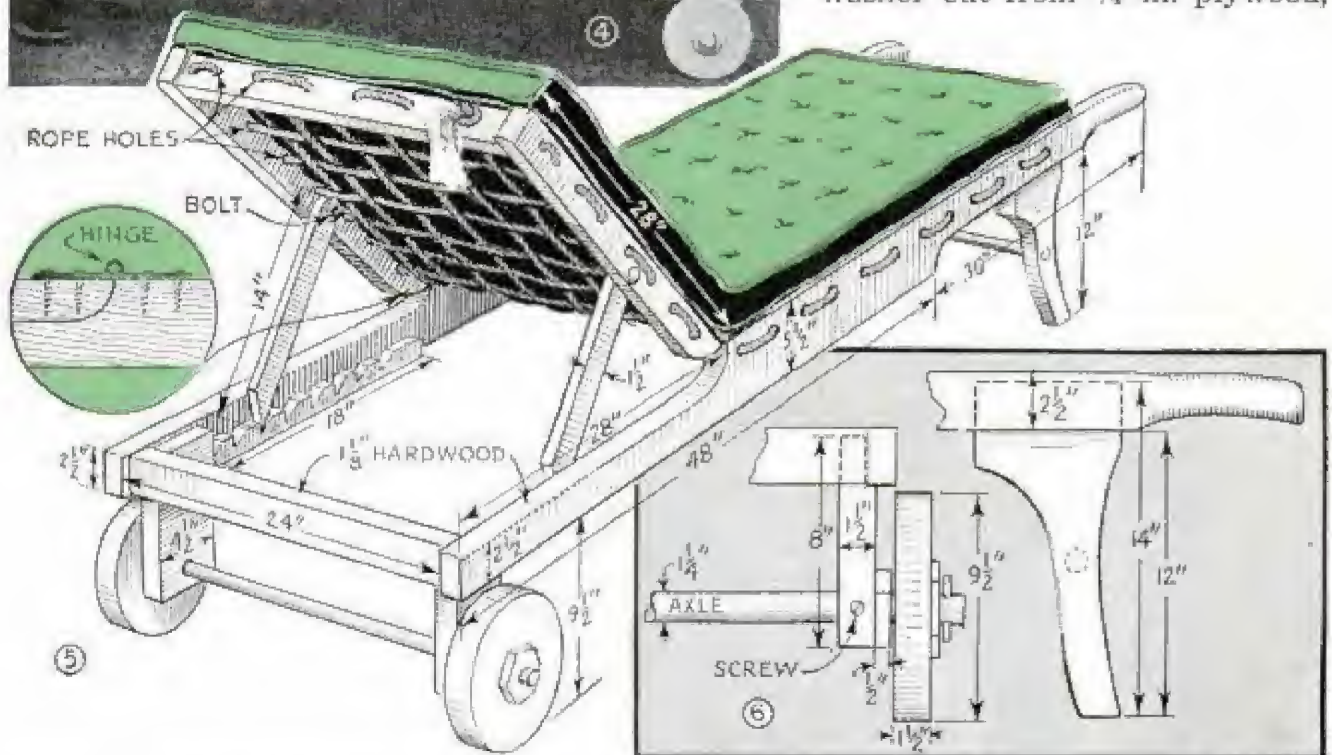


By R. DE WITT MILLER

WHEN you move outdoors on mild summer days this combination lounge and chair will provide just the sort of comfort you need for a period of relaxation in the garden or on the lawn. There's nothing fussy or difficult about the construction as you will see from Figs. 1, 2, 3 and 4. You



Rope "springs" and a day-bed or camp mattress make this garden lounge comfortable on summer days. It can be wheeled anywhere



can make it in a few hours, ready for use.

The frame is made of $1\frac{1}{8}$ -in. oak or other hardwood cut to the dimensions given in Figs. 5 and 6. Notice how duplicate cuts are made in the side members to form a handle at one end and the adjustable back at the other, Fig. 5. There are three cross members, all exactly the same length. The two joining the frame side members are $2\frac{1}{2}$ in. wide, while the one joining the top of the adjustable back is only 2 in. wide. The wheels are simply disks cut from $1\frac{1}{2}$ -in. hardwood. No need to be particular about the thickness, though, for $1\frac{3}{4}$ -in. stock will do as well. Fig. 6 specifies a round hardwood rod $1\frac{1}{4}$ in. in diameter for the axle, but, if you do not have a lathe, se-

lect a straight-grained dowel, 1 in. in diameter. The rising back is hinged to the frame with two strap hinges and supported by a rack-and-pawl arrangement made from hardwood scrap. Duplicate racks of suitable length are easily cut with a hand saw and screwed to the frame. The pawls which support the rising back are fastened to the side members with a small bolt as in Figs. 1 and 5.

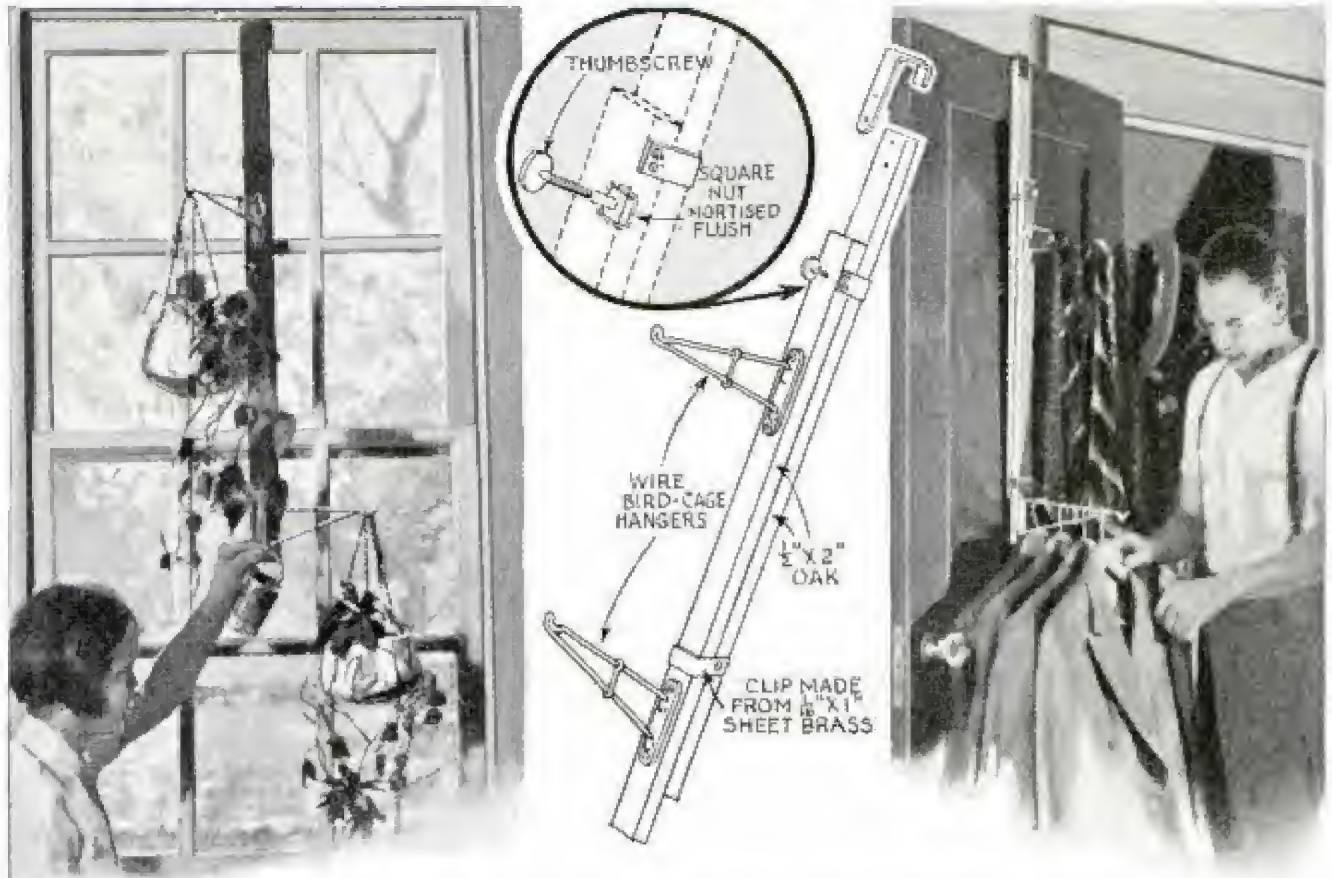
Screws through the axle support into the axle prevent its turning and allow the wheels to run loose. A $\frac{1}{4}$ -in. dowel and a round washer cut from $\frac{1}{4}$ -in. plywood,

Fig. 6, hold the wheels in place on the axle.

Light rope or clothesline is laced through holes in the frame spaced 4 in. apart. This is drawn taut and secured at each end with a knot. The natural stretch of the rope will form a springy support for the cushion which can be either a day-bed or camp mattress of suitable size.

The finish of the frame can be most any color that suits your fancy. If you want the wood in the natural color, first sand all surfaces smooth and then apply two coats of spar varnish to protect against weathering. Or, if a colored enamel finish is desired, the wood should be sanded thoroughly and given a flat coat, followed by two coats of high-gloss enamel.

Portable Hanger Fits over Door or Window



Here is an adjustable hanger that can be hung on the inside of a closet door to support clothing, as shown at the right, or it can be suspended from a window sash or frame to take hanging flowerpots, fish bowls, bird cages, etc. The hanger consists

of two strips of wood that slide in metal bands and can be locked together with a thumbscrew. Bird-cage hangers from which articles are suspended, are screwed to one of the strips, and a U-shaped hook is screwed to the other strip.

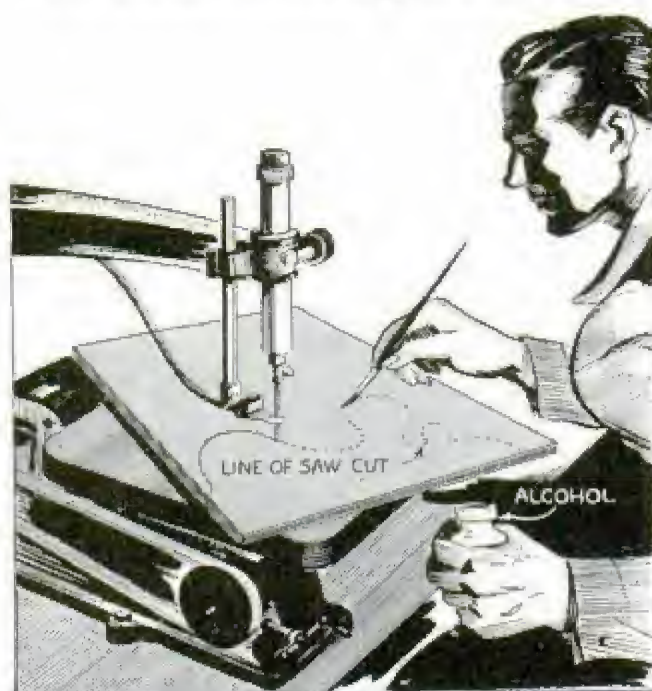
Footrest on Lawn-Swing Platform Assures More Comfort

For adults who like to do reading, knitting, or some household jobs while sitting in a lawn swing, and find that the slatted platform is sometimes rather tiresome on the feet, more comfort can be assured by providing a simple footrest of the kind shown on the right. The rest consists of two triangular-shaped blocks to which suitable lengths of thin stock are nailed. If desired, corrugated sheet rubber can be cemented over the wood. Almost any method of rigidly bolting the footrest to the platform will do.

☛ By pressing your hand lightly around a can containing dog food or other semi-solid substances, such as cranberry sauce, salmon, etc., the contents usually will slip out intact.



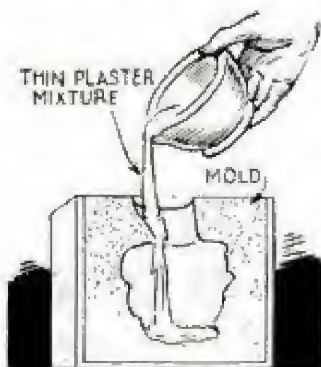
Alcohol Dissolves Rosin in Wood to Avoid Breaking Saw Blades



A home-workshop owner who had a number of very resinous plywood panels to cut on a scroll saw prevented sticking and breaking of the blades by first painting over the saw line on the wood with alcohol. This penetrated the wood quickly and cut the rosin under the heat of the blade. Each piece of the plywood was treated just before it was to be sawed, in order that none of the alcohol would be lost by evaporation.

Making Hollow Plaster Casts Without Cores

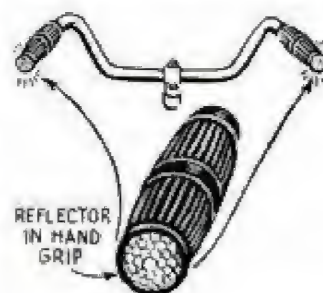
One tradesman finds that it is unnecessary to use a core to produce hollow castings from plaster of paris. The trick is accomplished by first pouring a thin mix of the plaster into the mold, then closing the opening and shaking or rotating the mold so that the plaster is thrown into



contact with all surfaces. If mixed to the proper consistency, the plaster will cling to the inside of the mold, and set to produce a hollow casting.

Bicycle Handlebar Has Reflectors in Ends of Grips

One boy who used his bicycle at night put red reflectors in the rear ends of the handlebar grips in addition to a large one on the rear fender. As the handlebar is moved almost constantly to keep the bicycle balanced, the reflectors attract attention of motorists. To install the reflectors, the rear ends of the grips are cut out, leaving just enough rubber around the outside to serve as a retaining edge.



Rubber Stirrups on Stilts Safe and Comfortable

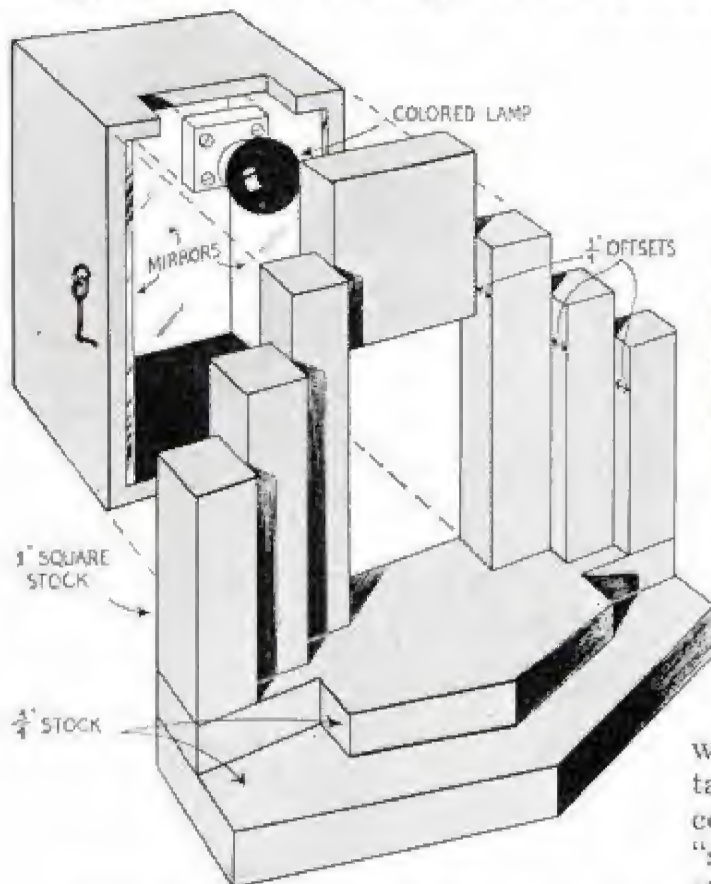
Difficulty often encountered in making a pair of stilts is in providing stirrups that are safe and comfortable. Don't overlook



the possibilities of using old auto tires for the purpose. You can cut out pieces to the shape shown and nail them to the stilts.

¶ You will find that scissors are more efficient than a knife when removing seeds and pulp from peppers, especially when they are to be stuffed.

Figure in Lamp Is Reflected under Soft Light



Charm and beauty of back-lighting and reflection, so popular in the newer public buildings, may be yours on a small scale in this ornamental radio lamp. The centerpiece is a chromium-plated radiator ornament or a pure white porcelain statuette of simple design. The stage is made of scrap

wood. Cover with clear varnish and when tacky sprinkle with "silver" sand, or, if a color is preferred, with sign-painters' "smalt," or with colored sand sold by toy stores for use in children's sand pens. The box behind the stage is lined with mirrors in which the centerpiece is reflected under colored illumination from a tiny lamp such as a 110-volt Christmas tree lamp, mounted overhead where it cannot be seen from the front.

—J. H. Dunnewin, Grand Rapids, Mich.

Thumb Indexes on Reference Books Will Save User's Time

Anyone can cut thumb index notches with a $\frac{1}{2}$ -in. inside-bevel chisel or gouge, so that phone directories and reference books frequently used, will be more convenient. A piece of thin plywood or hard-pressed board serves as a stop, this being inserted at the page where a tab is to be placed. Tabs can be lettered by hand or with a typewriter; they should be larger in size than the cut-out portions of the pages and are glued in position after all the cuts have been made.

—James R. Griffin, Corvallis, Ore.

❑ A curling iron is handy for stretching the fingers of gloves after washing them. Slip the iron in the finger and press the handles together to stretch the material.

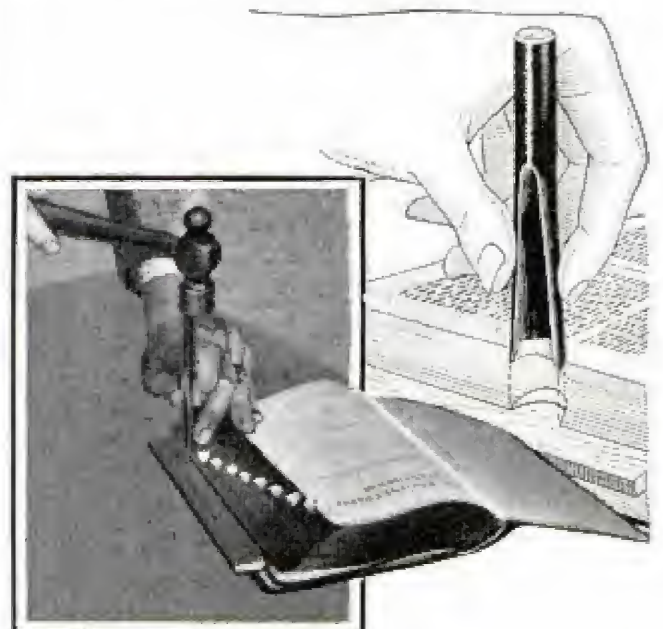


Diagram illustrating the construction of a wicker chair, showing the main assembly and detailed views of the posts and handle.

Main Assembly Dimensions:

- Overall height: 17"
- Overall width: 17"
- Backrest height: 12 1/8"
- Backrest width: 13"
- Seat height: 16 1/4"
- Seat width: 11 1/4"
- Leg height: 15"
- Leg width: 8"
- Bottom board width: 15 3/4"

Post Details:

- SIDE POST:** 1/2" HOLE 5/8" DEEP
- CROSS SECTIONS AT POINTS INDICATED:** 3/4" x 1/2"
- PATTERN OF HANDLE:** 1/2" x 5/8" TENON
- DOWEL GLUED INTO SLANTED HOLE:** 1/2"
- WEAVING OMITTED FROM FRONT & REAR PANELS FOR CLARITY:**
- BOTTOM BOARD:** EDGES ROUNDED, 1/2" DOWELS

Panel Details:

- PANELS ARE FILLED WITH WOVEN ASH SPLINT OR LEATHER, 1/2" IN. WIDE
- 2 SQUARES

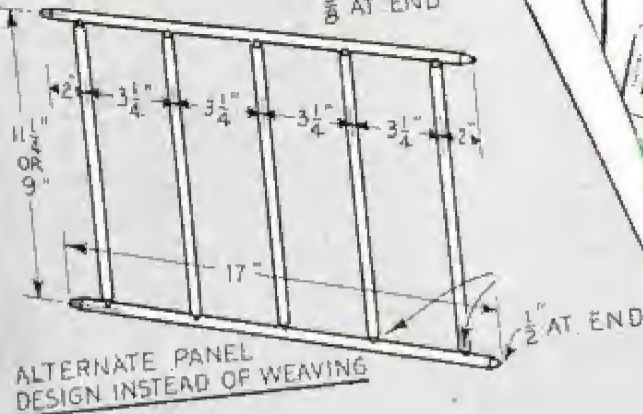
Post Labels:

- CENTER POST
- CORNER POST

with Woven-Splint Panels

MAKE ALL PIECES
OF MAPLE
FINISH IN WALNUT

ALL PIECES
MADE WITH
3/8" DOWEL ROD
3/8" AT END



ALTERNATE PANEL
DESIGN INSTEAD OF WEAVING

MATERIAL LIST

- 2 Pcs. 1 1/2 x 1 1/2 x 20 in.—Vertical posts
- 4 Pcs. 1 1/2 x 1 1/2 x 16 in.—Corner posts
- 2 Pcs. 1 1/4 x 3 x 15 in.—Base
- 1 Pcs. 3/4 x 8 1/2 x 15 3/4 in.—Bottom
- 1 Pcs. 3/4 x 1 1/2 x 17 in.—Handle
- 6 Pcs. 5/8 x 17 in. dowel rod—Horizontal rails
- 4 Pcs. 5/8 x 9 in. dowel rod—Slant-side panels
- 2 Pcs. 5/8 x 11 1/2 in. dowel rod—Vertical rails
- Ash splints or leather thongs for panels

ASH OR HICKORY SPLINTS
OR LEATHER THONGS

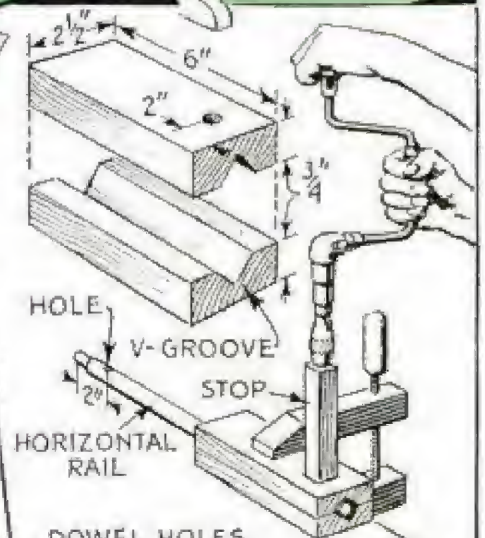
HORIZONTAL
RAIL

THE LETTERED SPLINTS
ARE ALL WRAPPED AROUND
FIRST—THEN #1 IS WOVEN OVER
TWO LETTERED SPLINTS THEN UNDER
TWO, ETC. #2 IS OVER ONE THEN UNDER
TWO ETC. AFTER COMPLETING FOUR, THE
WEAVE STARTS OVER AS AT #1

DETAIL OF WEAVING

UNDER SIDE
SAME AS TOP

Neat because of its graceful turnings and unusual woven ash or hickory-splint panels, this magazine basket is also sturdy and will withstand long usage. It holds about thirty average size magazines in a convenient position for easy removal. A handle on the center panel provides ease in carrying. If desired, leather thongs may be used for the woven panels instead of the wood splints



DOWEL HOLES
IN THE
HORIZONTAL
RAILS ARE
BORED IN
A JIG

SPOKE
SHAVE

HANDLE

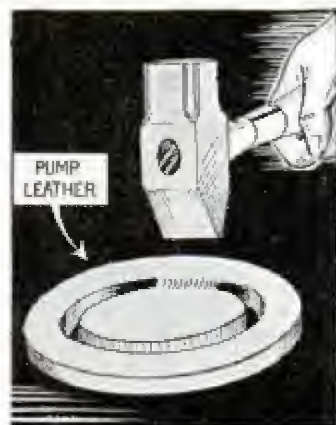
HANDLE IS SHAPED WITH A
SPOKE SHAVE AND SANDPAPER

This Improved "Camp Stove" Smothers the Fire



To avoid starting forest fires by careless handling of a campfire, one sportsman recommends this stove for campers who stay only a short time in one place. It consists of two or more iron rods supported on rolls of sod, which are turned back to provide a bare spot for the fire. When finished with the fire, the rods are removed and the sod is rolled back into place, covering the coals and effectually smothering all flames or sparks that may remain.

Installing Leather Pump Valves

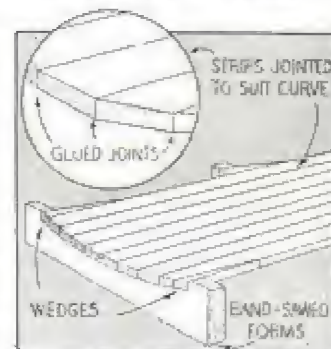


valve wears rapidly at this point. A better way is to dent the hinge portion with a hammer, which softens the leather so that the valve works freely without leaving a crevice where sand can enter.

When installing leather pump valves, some workmen score the hinge section with a sharp knife so that it will work efficiently from the beginning with the result that sand works into the score and the

Forms to Glue Curved Work

Gluing together a number of narrow strips to produce a curved surface is done easily and accurately by using forms of the type shown. Use hardwood and band-saw them to the desired curve, leaving shoulders at each end. Then joint the edges of the strips at a slight bevel to suit the curve, apply the glue and lay strips in the forms. Wedges driven between the outside strips and the shoulders of the forms force all of the strips tightly together.—John E. Hyler, Peoria, Ill.



Drawing Board Hinged to Wall Adjusted by Drawer Pull

Any amateur draftsman who works at home and has a drawing board hinged to a

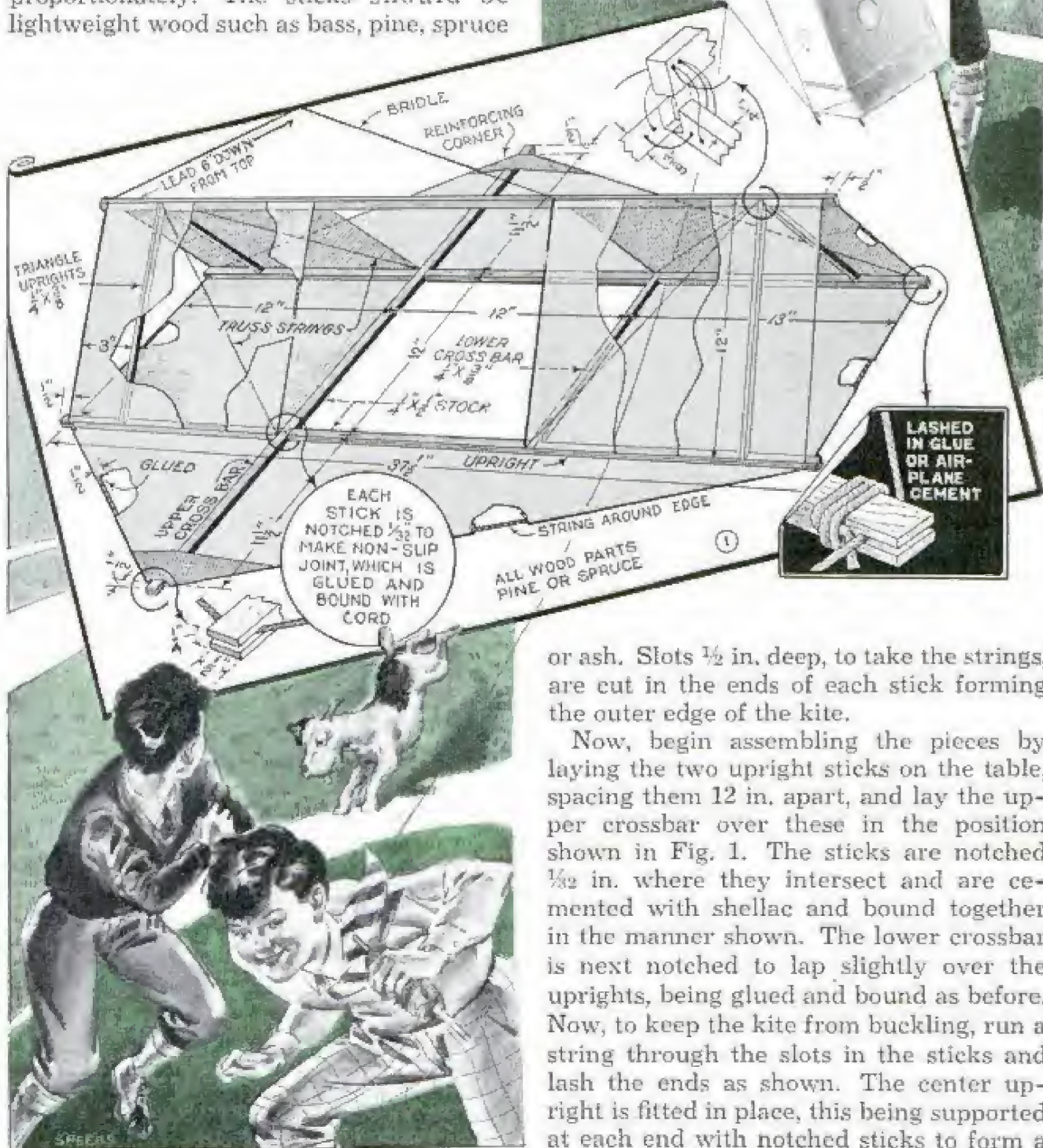


wall to save space will find that a drawer pull, attached as indicated, will provide a slot to support the leg of the board and hold it at the proper working angle.

¶If you want wild ferns to grow in your garden, plant them in plenty of black soil in which they grew in the woods.

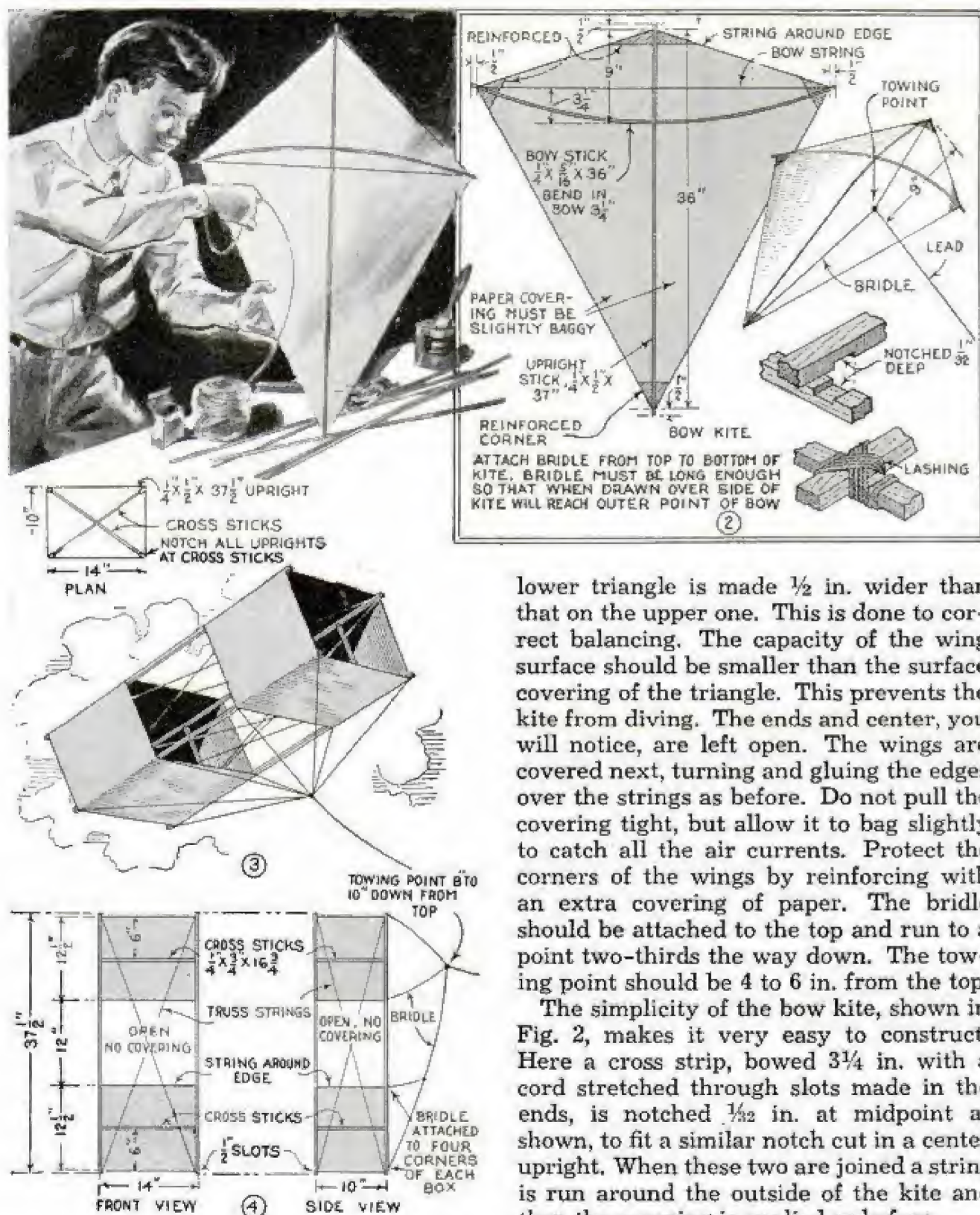
It's KITE TIME again!

REQUIRING no tails to balance them in flight, here are three easy-to-make kites which will give you a lot of fun both in constructing and flying them. While dimensions given for the French war kite, Fig. 1, should be followed closely to assure perfect balance, the kite can be made any size provided the dimensions are increased proportionately. The sticks should be lightweight wood such as bass, pine, spruce



or ash. Slots $\frac{1}{2}$ in. deep, to take the strings, are cut in the ends of each stick forming the outer edge of the kite.

Now, begin assembling the pieces by laying the two upright sticks on the table, spacing them 12 in. apart, and lay the upper crossbar over these in the position shown in Fig. 1. The sticks are notched $\frac{1}{2}$ in. where they intersect and are cemented with shellac and bound together in the manner shown. The lower crossbar is next notched to lap slightly over the uprights, being glued and bound as before. Now, to keep the kite from buckling, run a string through the slots in the sticks and lash the ends as shown. The center upright is fitted in place, this being supported at each end with notched sticks to form a



lower triangle is made $\frac{1}{2}$ in. wider than that on the upper one. This is done to correct balancing. The capacity of the wing surface should be smaller than the surface covering of the triangle. This prevents the kite from diving. The ends and center, you will notice, are left open. The wings are covered next, turning and gluing the edges over the strings as before. Do not pull the covering tight, but allow it to bag slightly to catch all the air currents. Protect the corners of the wings by reinforcing with an extra covering of paper. The bridle should be attached to the top and run to a point two-thirds the way down. The towing point should be 4 to 6 in. from the top.

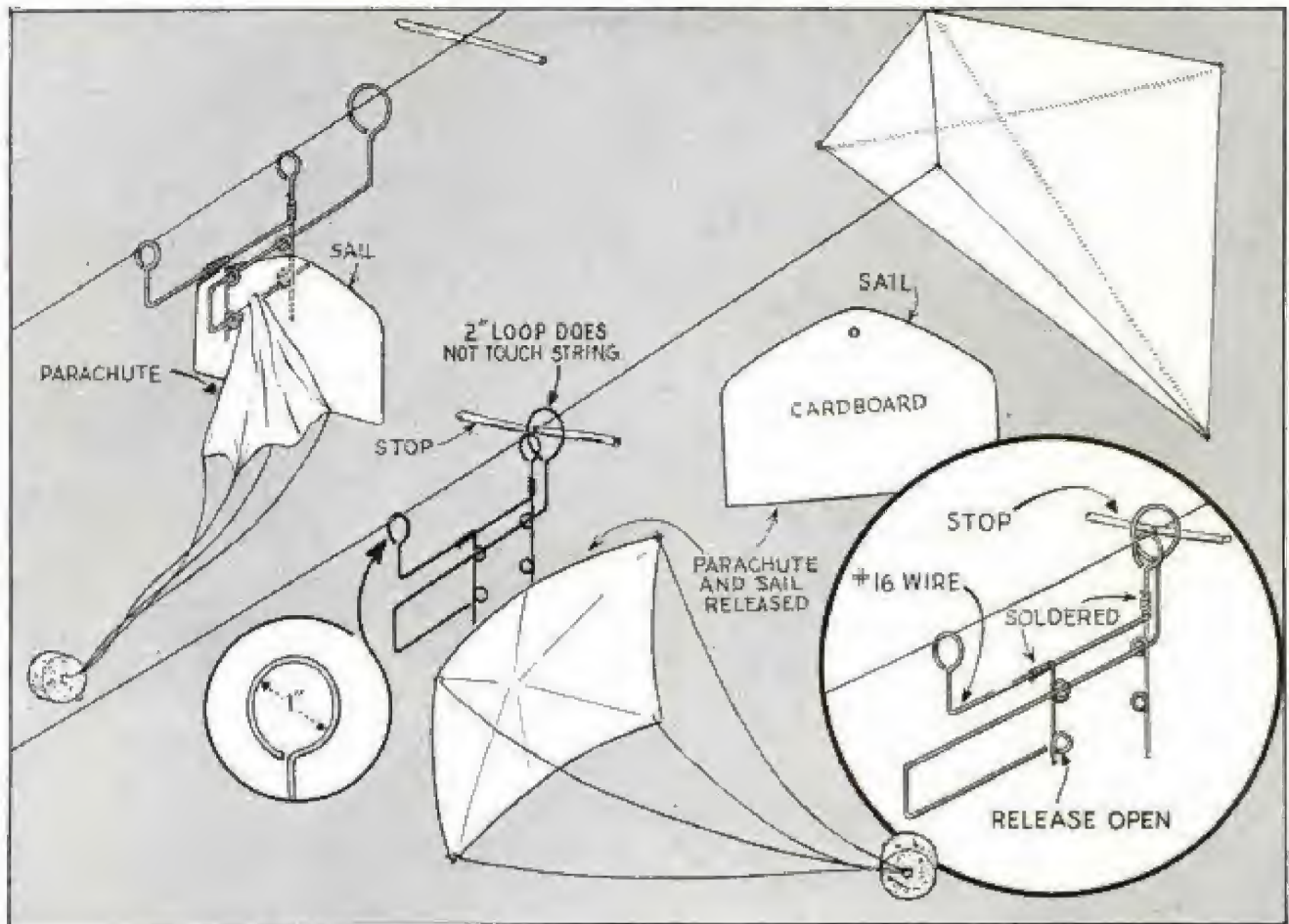
The simplicity of the bow kite, shown in Fig. 2, makes it very easy to construct. Here a cross strip, bowed $3\frac{1}{4}$ in. with a cord stretched through slots made in the ends, is notched $\frac{1}{2}$ in. at midpoint as shown, to fit a similar notch cut in a center upright. When these two are joined a string is run around the outside of the kite and then the covering is applied as before.

To make the box kite in Fig. 3, four slotted uprights of identical size are assembled into two pairs of corresponding units by notched cross sticks. The units are joined then, into box-shape, and truss strings are stretched from the corner slots to keep it rigid and straight. The paper covering is made $\frac{1}{2}$ in. wider on the lower box than on the upper. The towing point should equal the length of the kite.

triangular shaped assembly. When dry, run a string around the inner edges of the triangles to support the covering and, then brace them with several cross strings stretched on each side. Parchment or heavy-grade kite paper is the best covering material. Cellophane can be used also.

Cover the three sides of the two triangles and fold and glue the edges of the paper over the string. The covering of the

Dropping Parachutes Adds Zest to Kite Flying



Parachutes carried up to a lofty kite and automatically released when the carrier hits a cross stick tied in the kite line, will keep up a lively interest. The carrier must be lightweight and there should be very little friction on the line so that ascent of the carrier will not be impeded. A cardboard sail and a parachute are held on a sliding member, which is pushed back when it strikes the cross stick, releasing

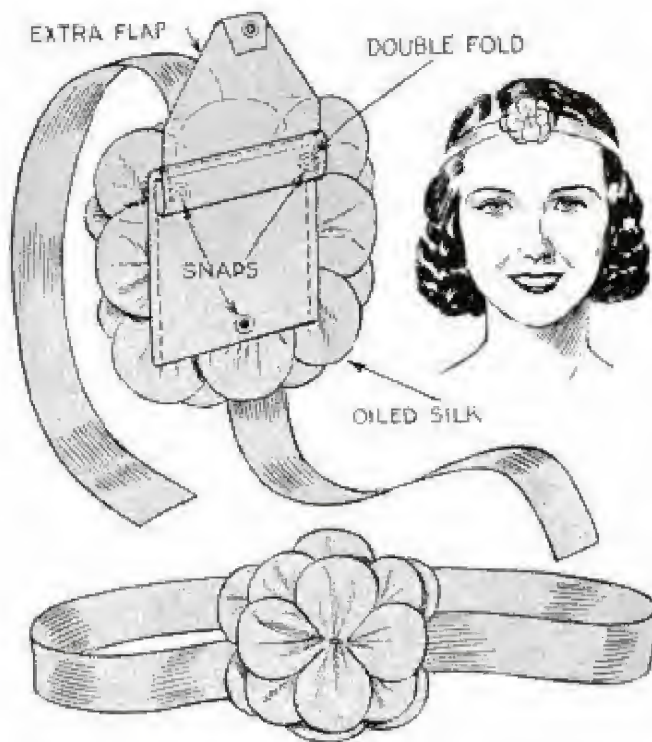
both sail and parachute. By carefully going over all of the details you will readily see how the releasing device works. While you can make it from aluminum wire, if readily available, ordinary No. 16-gauge iron wire should not be too heavy. Be sure that the sliding parts work easily yet will not shift without the proper impulse. You will have to experiment with the sail to get a cardboard of the proper size.

Sun Deck on Garage Reached by Novel Corner Ladder

Easy access to the top of a flat-roof garage, which was utilized by children as a sun deck, was made possible by means of an improvised ladder consisting of 14-in. lengths of 1-in. dowel stuck through holes bored in the corner as shown. A small nail was driven into each dowel to keep it in position. This was found much safer than a separate ladder and also much neater in appearance. If at any time the dowel corner ladder would fall into disuse, it would serve nicely as a corner trellis for climbing vines and flowers.

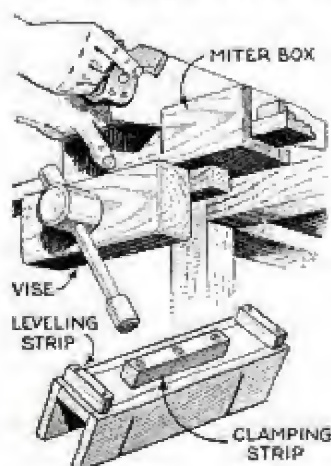


Small Purse in Bather's Headband Holds Valuables



This ornamental flower headband, made of oiled silk, has a purse on the back to hold a bather's coins, keys and other valuables. The petals of the flower are 3 by 1½-in. strips, cut round at the ends and gathered and sewed together at the center with thread or yarn of contrasting color. The purse is a 2 by 5-in. strip of material, folded about ½ in. beyond the center and sewed at the sides to the flower. The flap is folded over and is fastened in place with small snaps. An extra flap, over the first one, may also be provided. A narrow strip of material for the headband is then slipped between the flower and the purse.

Clamping Miter Box in Vise

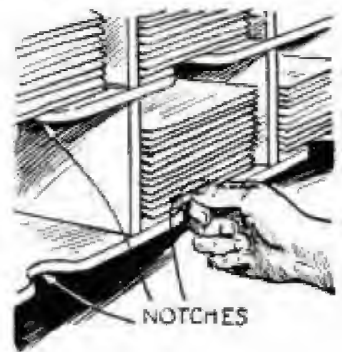


By screwing a hardwood strip to the bottom of your miter box, it can be clamped rigidly in a vise where it is at the right working height, making it unnecessary to clear off space on the bench. Two strips of the stock, the

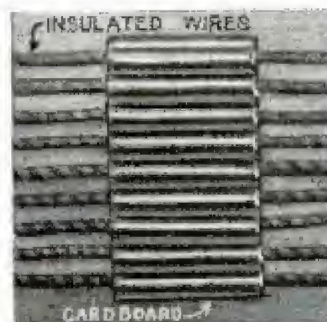
same thickness as the clamping block, can be screwed across the ends of the box to keep it level when you want to use it on top of the bench.

Pigeonholes of Desk Notched to Remove Papers Easily

Notches cut in the front edge of pigeonholes of a desk permit you to remove papers and envelopes easily. The cutting can be done with a coping saw or a sharp knife.



Low-Voltage Wires Held Neatly by Corrugated Paper

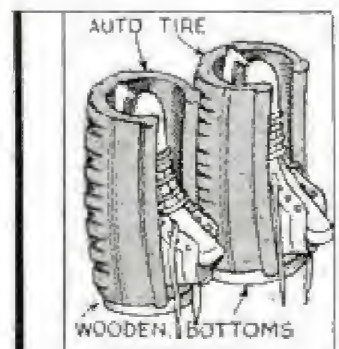


In model and experimental work where insulated bell wire carrying low voltages is used for temporary circuits, strips of corrugated paper provide handy clips

or brackets for fastening the wire. The paper is especially handy where the use of staples is objectionable. Just glue the strips in place and thread the wires through the corrugations.

Rubber Holders to Store Skates

Your skates will be well protected against nicking if you store them in these holders, which are nailed to the wall. Cut off two suitable lengths of auto casing and nail wood disks into the lower ends.



☞ To blow large soap bubbles, add a little glycerin to warm, soapy water.

3 *Smart* BENCHES

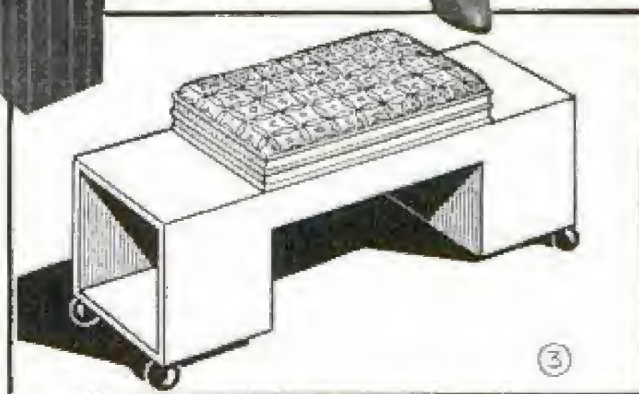


Finished in bone-white and black, and neatly upholstered, these distinctive benches for the home consist almost entirely of plywood. Magazine baskets and book racks are incorporated in two designs



By WAYNE C. LECKEY

SIMPLE upholstery makes any one of these benches easy to construct in your home workshop. The one shown in Fig. 2, is, perhaps, the least difficult of the three since the construction centers around a simple, box-like framework of plywood. Fig. 6, gives full dimensions for this and assembly is made with plain, butt joints glued and nailed. The corners may be glued-blocked also, although the top when nailed in place provides great rigidity. Support through the center is made with a cross-piece of scrap stock. After the glue has dried, a rabbet is cut around the entire top edge as shown in the detail. This can be cut easily with a dado head either before or after the top is fitted. Putty all exposed nail heads at the corners and sand the end grain smoothly prior to the application of three successive coats of bone-white enamel, rubbed lightly between coats with fine steel wool.



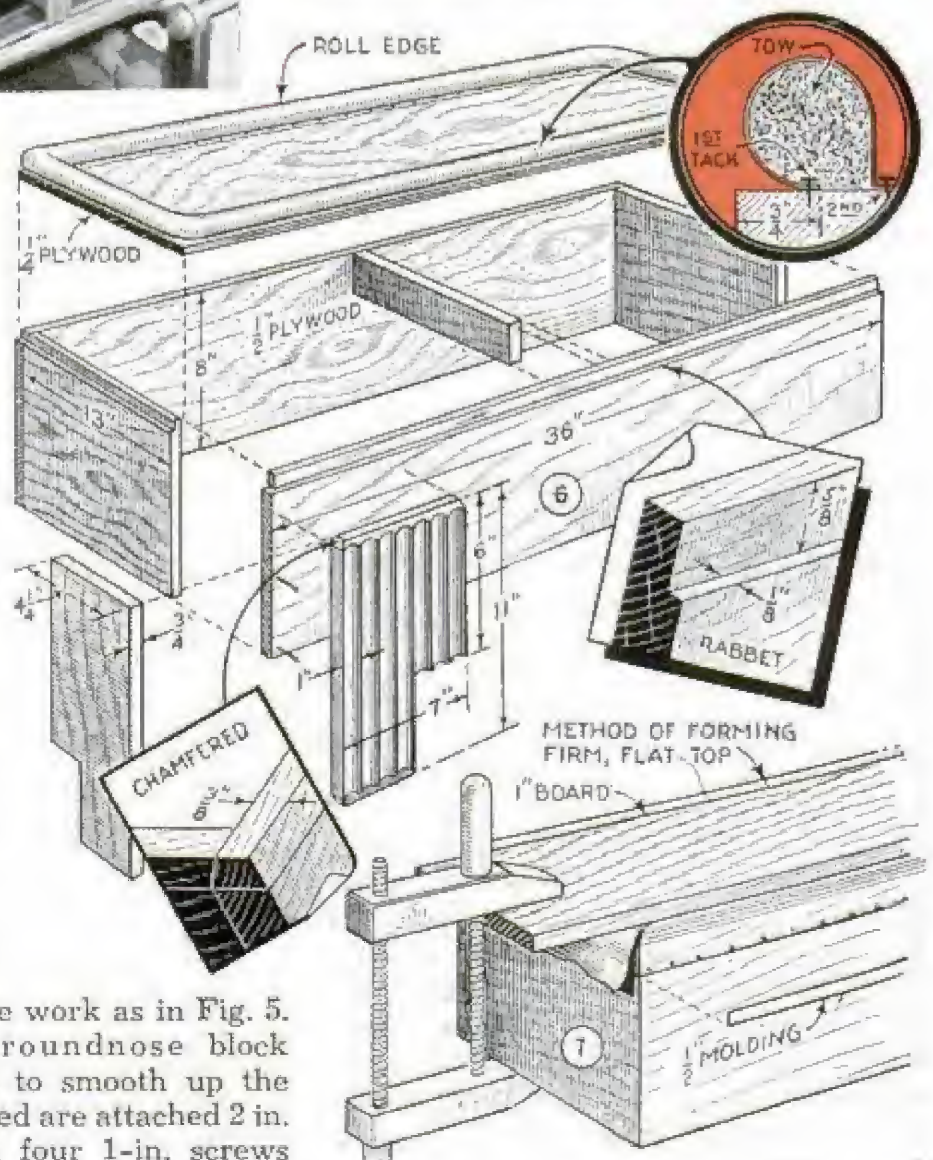
While this is drying you can cut the legs to size. These were made of walnut stock to contrast with the white finish but if you wish, they can be made of cheaper wood and stained to give a very close imitation. Note that the legs must be made in pairs when laying out the stock. Inverting the pattern will minimize waste. When cut, respective pieces are glued and nailed together to form a right angle, using clamps, if available, to draw the joints tight. The nail heads are sunk well beneath the surface so as not to interfere with fluting. The top and bottom edges are then chamfered



45 degrees as shown. If a molding head to make a cove cut is available, you can flute the legs quickly on the circular saw as shown in Fig. 4. Here the cuts are made on the face, working each way from the corner of the work. If it is necessary to cut these by hand, with straight-grain stock you can easily guide a 1-in. gouge along a straightedge clamped in position on the work as in Fig. 5. Use a large dowel or roundnose block wrapped with sandpaper to smooth up the cuts. The legs when finished are attached 2 in. down from the top with four 1-in. screws driven from the back.

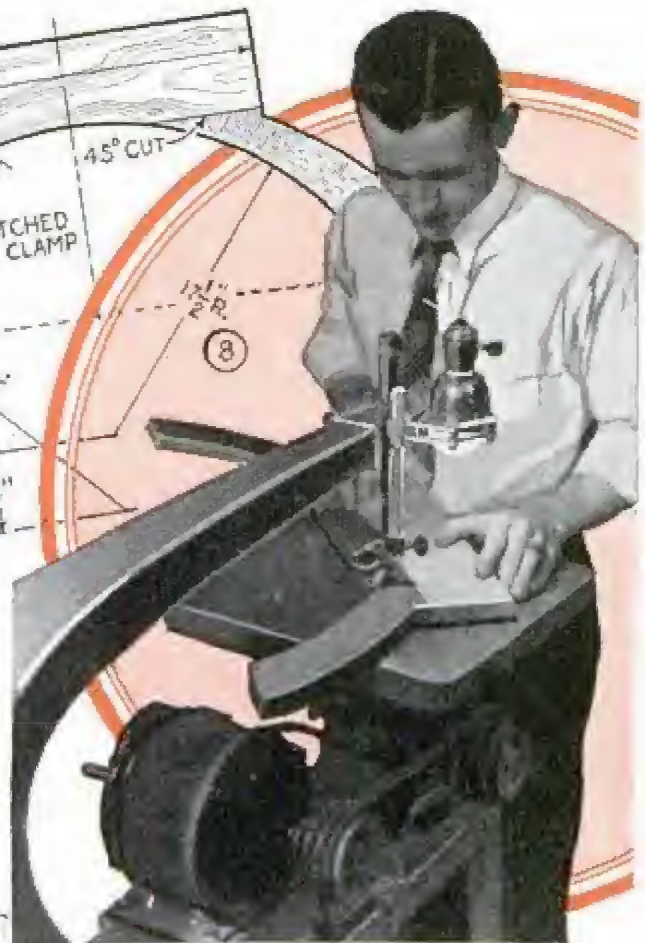
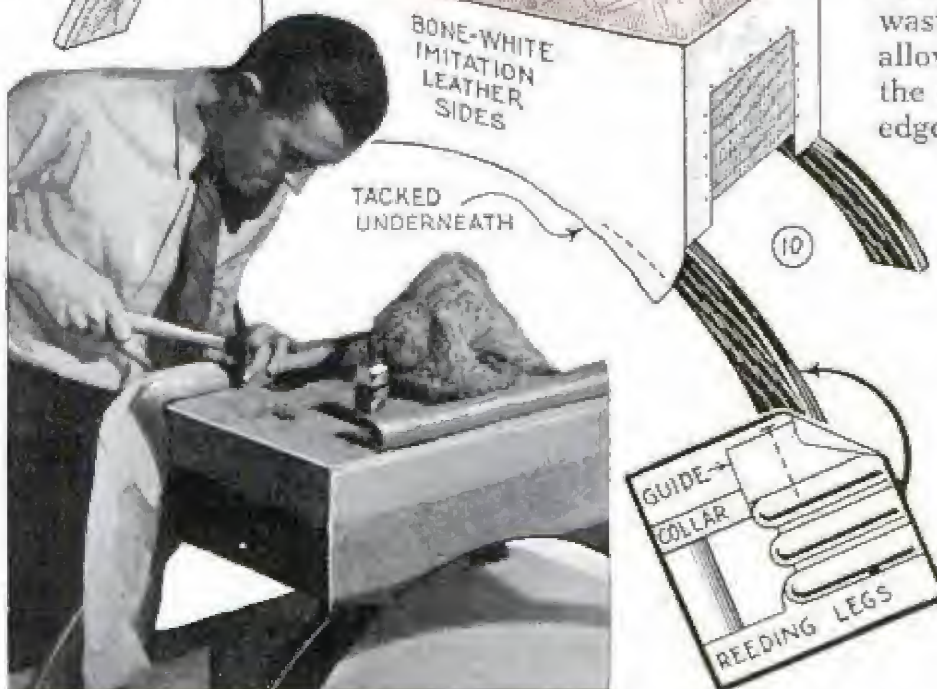
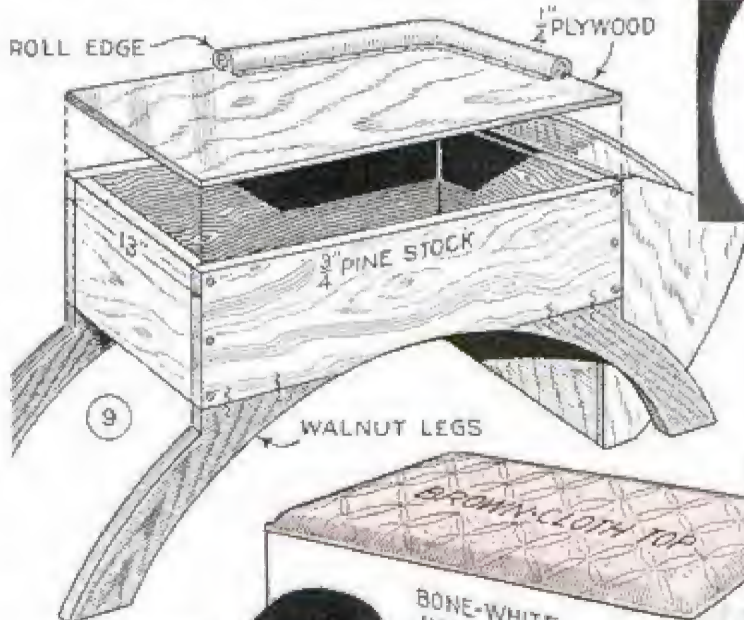
To upholster the top, it is necessary to first form a roll edge around the top to retain the filling. For this you will need a long strip of burlap cut $4\frac{1}{2}$ in. wide. With a pencil line drawn around the top $\frac{3}{4}$ in. in from the edge, begin tacking one edge of the strip along this line, using No. 2 tacks. Next add sufficient tow to form a $1\frac{1}{4}$ -in. diameter roll and

tack as in the detail, Fig. 6. Firmness of the roll can be had by stuffing with additional tow, using a long, slender screwdriver as a regulator. Use plenty of tow to fill the top within the roll edge, over which place several thick layers of cotton. As no welt is used on this bench, the cover is applied evenly by first tacking one edge

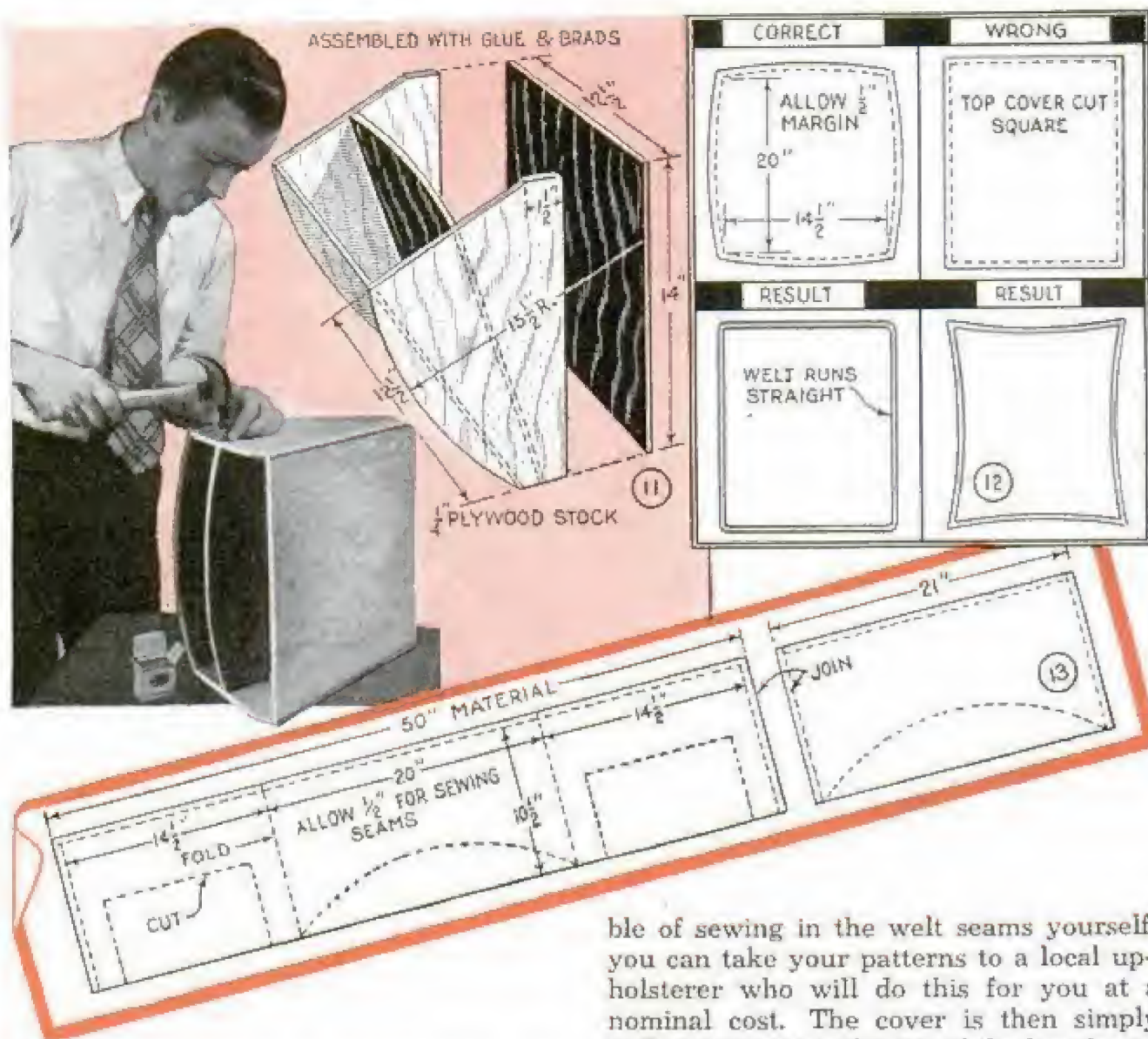


straight along the rabbet cut, after which the opposite edge is drawn fairly taut and tacked temporarily in place. A wide board placed on top of the cover as in Fig. 7, and pulled down with a clamp at each end, will allow you to tack the loose edge evenly and permanently. When the clamps are removed, the filling will expand, producing a firm, flat seat which will hold its shape. Strips of $\frac{1}{2}$ -in. aluminum molding, mitered at the corners, conceal the tack heads.

The attractive bench shown in Fig. 1,



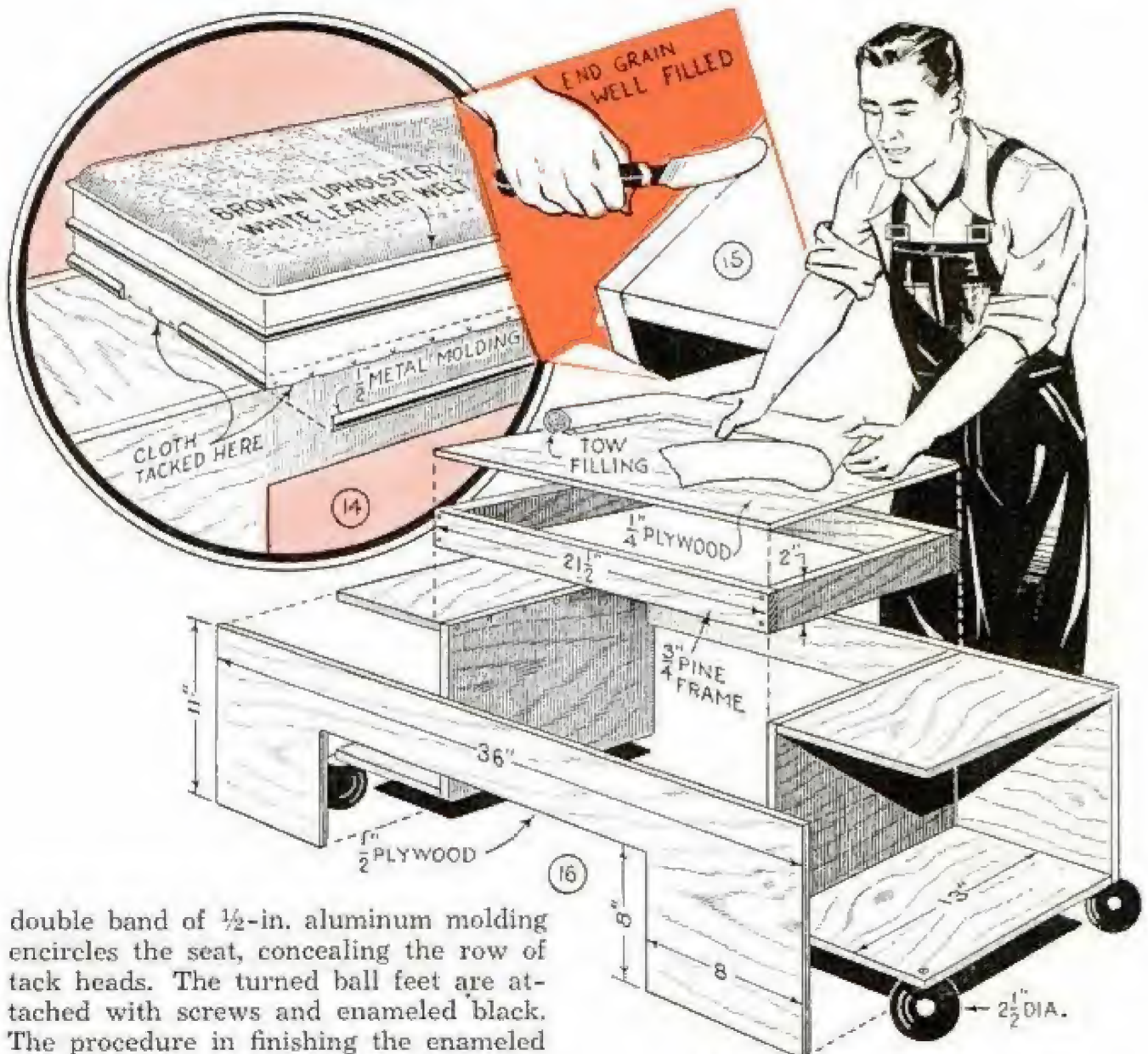
provides extra utility by having magazine containers at each end. The arched legs which continue into the frame are of walnut, joined at 45 degrees to a 5-in. pine board as shown in Figs. 8 and 9. Dowels may be used here as in Fig. 8, or glue and corrugated fasteners as in Fig. 9. A notch cut in the waste portion of the legs will allow a hand screw to draw the joint up tightly. The top edges of the legs may be left plain or if a shaper is available, you can reed the outer radius with three $\frac{1}{4}$ -in. beads as shown in the insert in Fig. 10. In this case a template of scrap wood, identical in contour, must be tacked temporarily to the face of the legs against which the spindle collar of the shaper can ride. Therefore, cut the outer radius first so that you will have



waste in which to tack the template. The sides are then joined together with pieces butted, glued and screwed at the ends, Fig. 9, after which, a plywood panel is nailed to the top. For a pleasing contrast, select a dark brown modern cloth for the top of the cover and imitation, bone-white leather for the sides. A roll edge is formed as previously described and filled with tow and cotton. From here on the procedure varies somewhat in that a muslin cover is tacked smoothly over the filling to allow the final cover to be slipped on without disturbing the padding. Fig. 12 gives the correct size and method for cutting the top cover, allowing $\frac{1}{2}$ in. additional for sewing in the welt. Cut the edge slightly curved rather than straight. Fig. 13 shows how the side cover can be laid out on just about the minimum of material. This necessitates joining one side cover which will bring a seam at two corners. If you are not capa-

ble of sewing in the welt seams yourself, you can take your patterns to a local upholsterer who will do this for you at a nominal cost. The cover is then simply pulled down over the top of the bench and tacked as in Fig. 10. The magazine pockets which fit between the legs are constructed of $\frac{1}{4}$ -in. plywood and assembled with $\frac{3}{4}$ -in. brads and glue, Fig. 11. Since the bench depends almost entirely upon these pockets for support, attach them solidly in place with screws. To avoid marring the paint while inserting them between the legs, spread the lower ends of the legs with a stretcher.

Also serving a two-fold purpose is the bench shown in Fig. 3, and fully dimensioned in Figs. 14, 15 and 16. As you will note, the construction is entirely of plywood, employing simple butt joints glued and nailed. Waste from the side pieces can be utilized for inner members. A rectangular frame of $\frac{3}{4}$ -in. pine surmounts the center of the bench to which is nailed a top panel of $\frac{1}{4}$ -in. plywood. Upholstery procedure is the same as before, tacking the sides of the cover as shown in Fig. 14. A



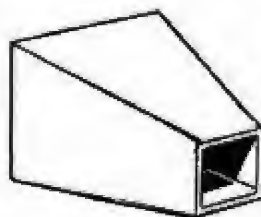
BALL FEET ATTACHED WITH SCREWS

double band of $\frac{1}{2}$ -in. aluminum molding encircles the seat, concealing the row of tack heads. The turned ball feet are attached with screws and enameled black. The procedure in finishing the enameled parts of all three benches begins with carefully filling all exposed end grain of the plywood. White-lead paste is excellent for this but it is necessary to give it plenty of time to dry. Wood putty will do, but it must be carefully sanded flush with the surface. It is important to sand all parts smooth with progressively finer grade of

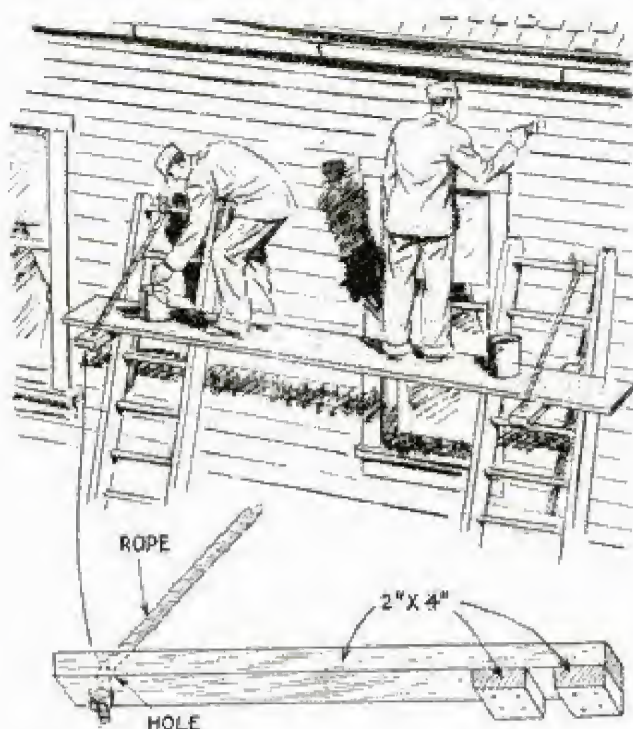
sandpaper before applying the enamel undercoater. Be sure to allow the undercoater to dry thoroughly. Follow this with three coats of good quality bone-white enamel, sanding lightly after the first and second coats with very fine sandpaper.

Cardboard 'Focusing Cloth' Helps Get Sharp Photographs

This cardboard "focusing cloth" is especially useful on shots made without a tripod. The image is focused sharply, the plate holder inserted, and the picture then composed in the finder. The large end is the same size as the camera's ground glass and the small end $2\frac{1}{2}$ in. wide. Use sturdy cardboard and paint the inside black.



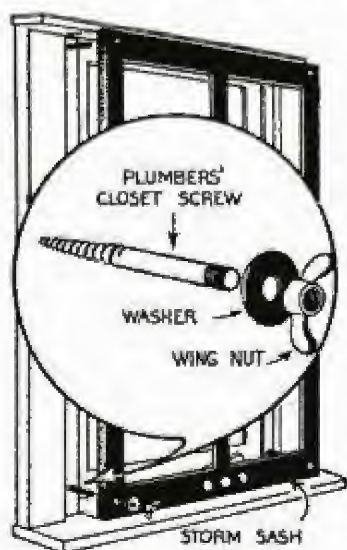
Ladder Jacks Improvised Quickly from Wood and Rope



A pair of ladder jacks are improvised easily from two lengths of 2 by 4-in. stock and some rope. Drill the stock at one end to take the rope, which is knotted on the underside to keep it from slipping through the hole. Then nail wood blocks at the other end as indicated, spacing them to straddle the ladder rungs.

—Bill Ball, Bellingham, Wash.

Easy Method of Fastening Screens and Storm Sash



The semi-annual changing of screens and storm sash can be simplified by fastening them to the window casings with plumbers' closet screws, which are bronze wood screws with a machine threaded end in place of a head. The screws also make

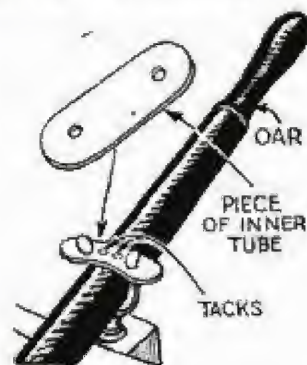
it possible to pull up the sash tightly at any point desired. Once installed, and the screen and sash frames bored to slip over

them, the screws need not be removed. Regular nuts can be used to hold the screens in place, although wing nuts are handier. Washers can be used to take up the difference in thickness between the sash and screen frames.

—Elwyn Tabbutt, Augusta, Me.

Rubber Strips on Loose Oars Prevent Loss or Twisting

To allow sufficient flexibility of your boat oars and at the same time keep them from twisting easily in your hands, cut two strips of rubber from an inner tube, perforate the ends to fit them

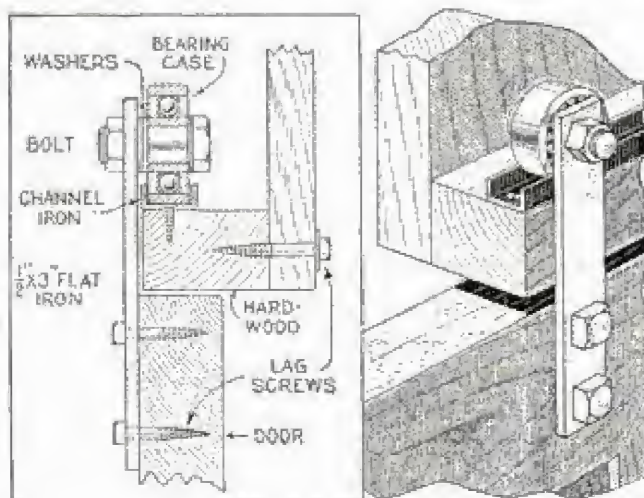


snugly over the lock, and tack the strips onto the oars at the desired point. These detachable fasteners will also help prevent the oars from being lost overboard.

—G. E. Hendrickson, Argyle, Wis.

Ball-Bearing Rollers for Doors

Rollers for sliding doors can be had inexpensively by utilizing ball-bearing assemblies from differentials and rear axles of junked cars. The doors are suspended from the bearings by lengths of flat iron,

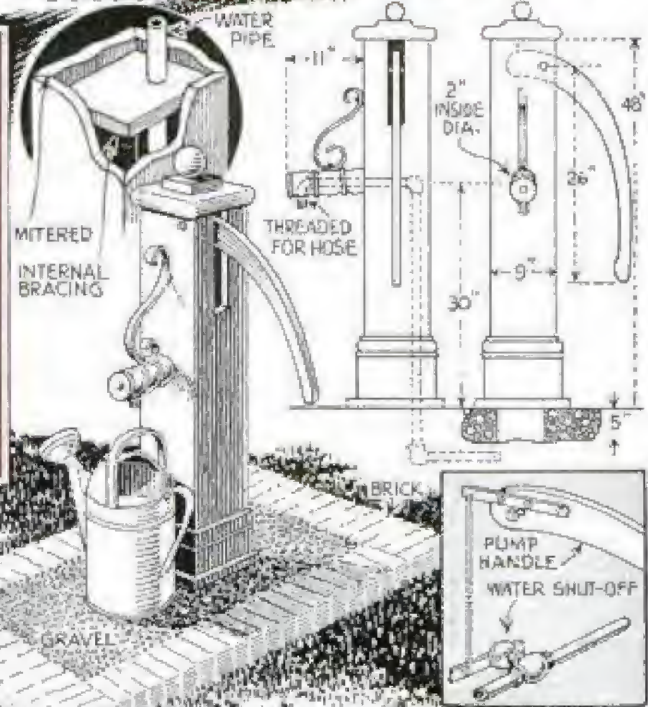
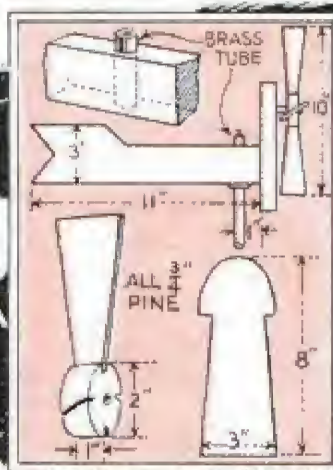
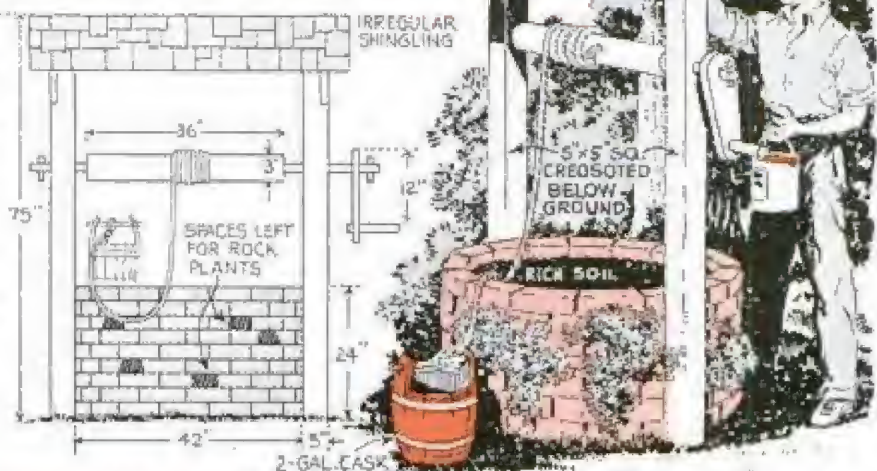


as shown in the detail, using channel iron as a track. This is screwed to a hardwood strip, which is in turn fastened to the wall above the doorway by means of lag screws.

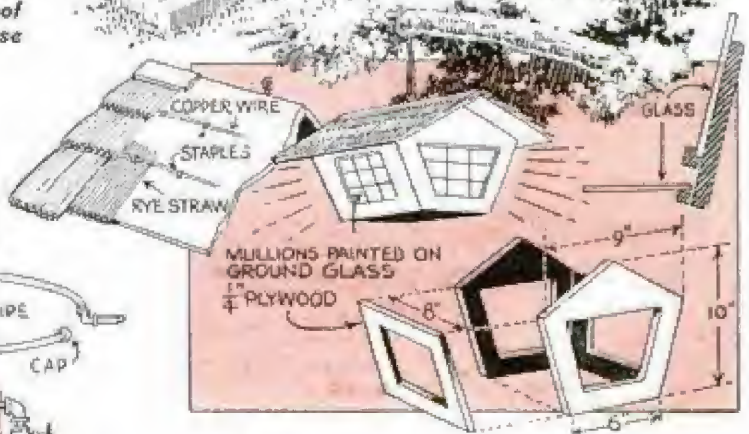
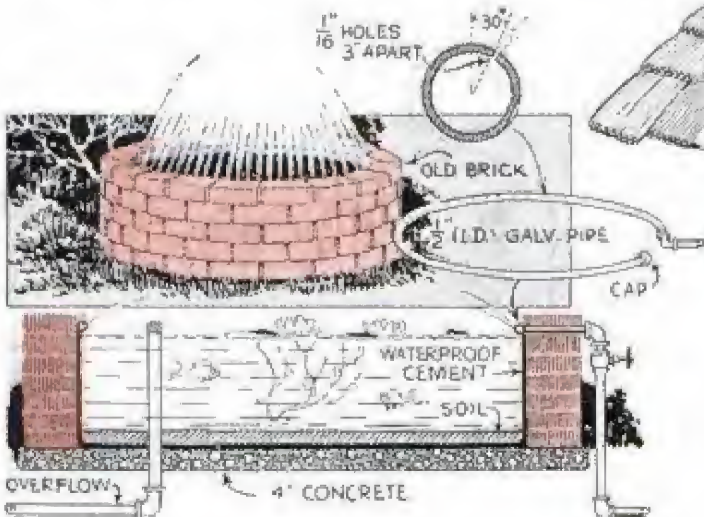
—C. H. Myers, Galesburg, Ill.

... *in wood and brick*

This imitation well and "old oaken bucket" makes an interesting feature in your garden, and is just the thing for a corner where nothing seems to fit in, especially when the structure is weather-stained and rock plants are established in the brick parapet. Or, a windmill of the novel design shown below, which projects above shrubbery instead of being perched on the peak of the garage, is colorful and sure to attract attention.

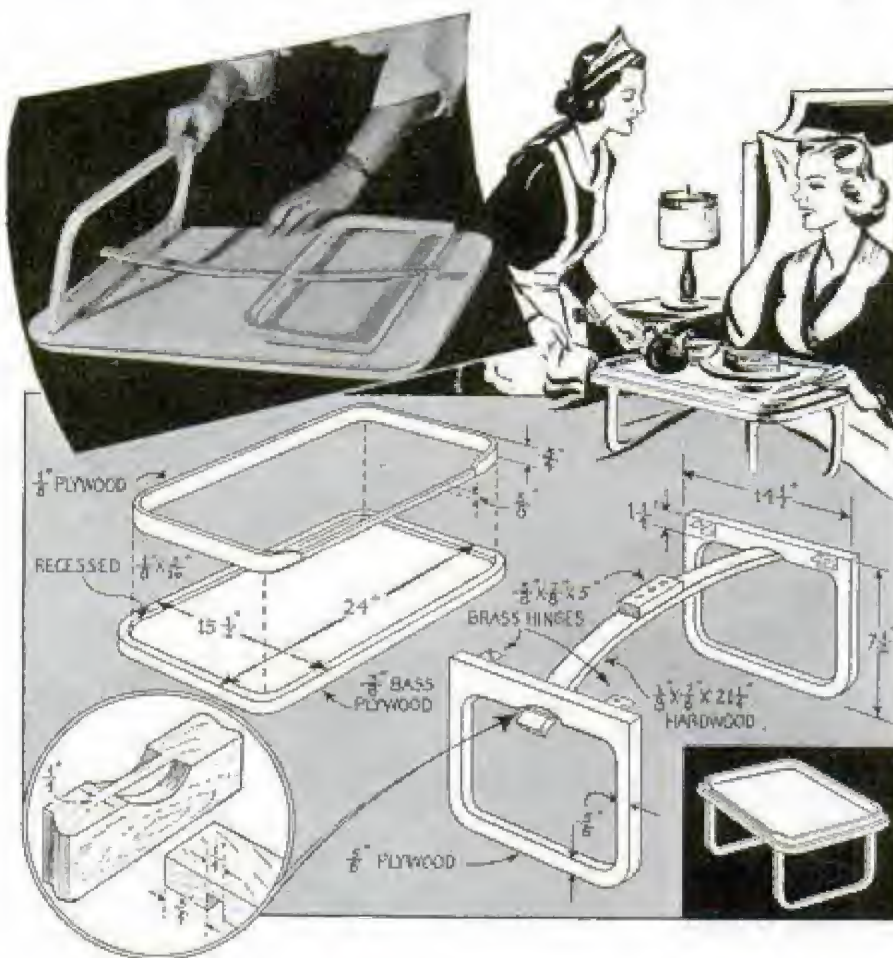


As picturesque as its counterpart of a generation ago, the pump at the right never needs priming; just raise the handle and water flows out the spout. It is connected to the home water supply and the handle operates the valve. If you would rather not connect it permanently with pipe, use a length of garden hose. The "water-dome" fountain below includes a pool lined with waterproof cement, and is built of brick on a concrete base



Stained to obtain a weathered effect, this hanging garden lamp, which resembles a miniature cottage, has a thatched roof and ground-glass windows

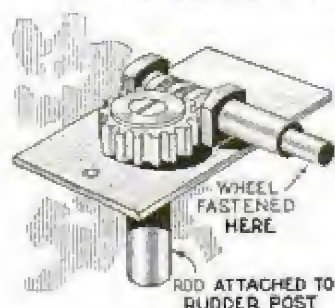
Compact Bed or Beach Table Can Be Folded for Storage



Assembled from plywood, this little table is light and sturdy, and the legs fold inward so that it takes little space when stored. It has a thin rim around three sides to keep dishes from slipping off the top, which is recessed near the edges to take the rim. A thin strip of hardwood screwed to the center of the table top on the underside is notched near the end to slip into notches in the legs and keep them opened as shown in the circular detail. The spring action of the wood strip also keeps the legs in position when they are folded.

—Frank Skalla, Niles, Mich.

Steering Gear for Model Ship Made from Banjo Key

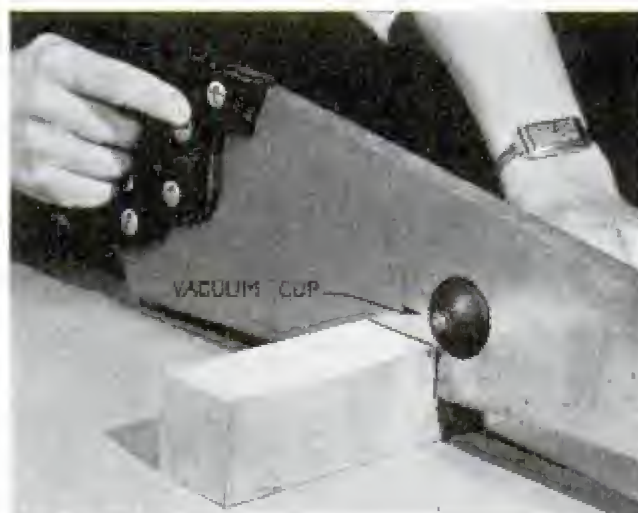


Ship modelers who want a realistic steering gear for a sailing ship will find that a tightening key from an old banjo serves the purpose

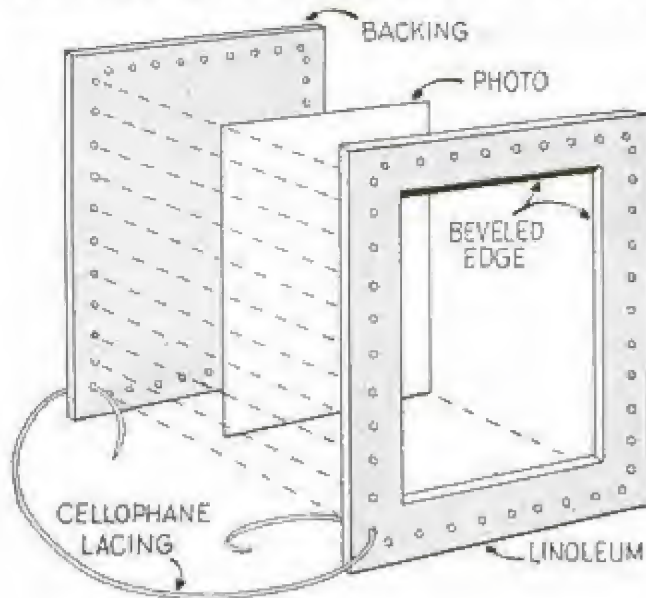
nicely. If one is not at hand, it can be purchased for a few cents. Generally, the keys are made up in sets, but it is a simple matter to divide the strip on which they are mounted. By removing the finger piece or handle and substituting a ship's wheel, and by extending a rod from the rudder post up through the poop deck, the portion of the key upon which the banjo string was intended to be wound may be joined to the rod with a small sleeve. A post must be set in place to take the key, after which the entire assembly can be inclosed in the model.

Vacuum Cup Serves as Depth Gauge on Hand Saw

You will find that a small vacuum cup provides a handy depth gauge for a hand saw. Just stick the cup on the blade with the lower edge at exactly the same distance from the teeth as the depth of cut desired. If the cup doesn't stick tightly, put a little glycerin or oil on the edge.



Linoleum Photo Frames Look Like Leather



Novel photo frames that resemble leather can be made from black or brown linoleum, or even hard-pressed board. Use leather thongs, heavy cord or similar ma-

terial to lace the edges of the frames. Or, if you want to add a little color, Cellophane ribbon provides an attractive lacing.

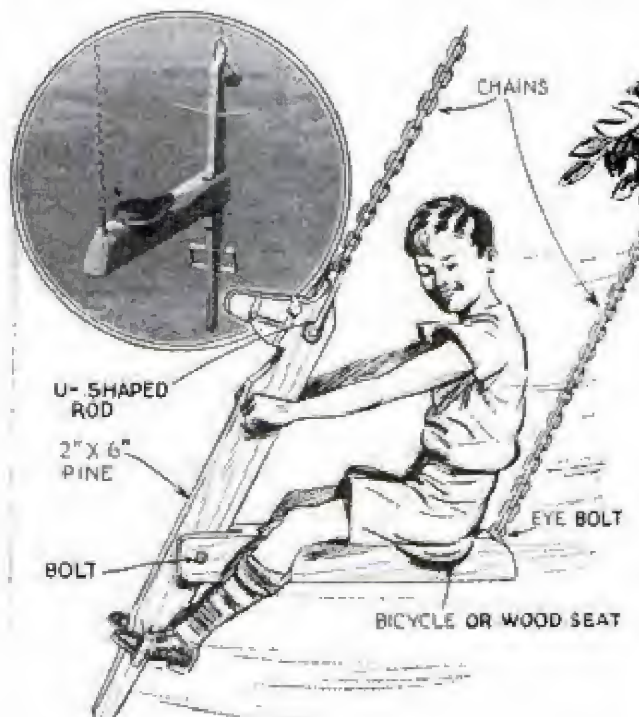
—Kenneth Murray, Colon, Mich.

Playground Pony Swing Is Pumped by Hands and Feet

Children get plenty of excitement and healthy exercise from this novel swing, which is shaped like a horse and pumped with the hands and feet. The body, about 40 in. long, is a 4 by 6-in. timber with the edges rounded to suit. The seat is set far enough back to give leg room for the child.

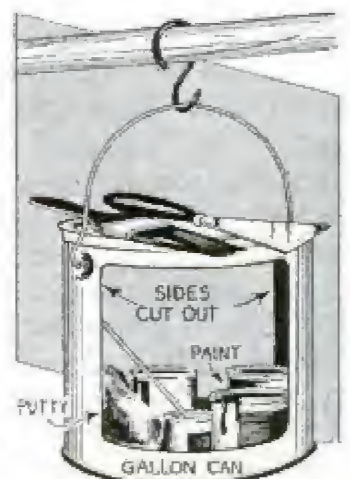
The upright has metal hand holds and looped stirrups, and is pivoted to the body with a $\frac{1}{2}$ by 5-in. carriage bolt. For added wear, this bolt should turn in bushings made of pipe. Either rope or chain can be used to suspend the swing as indicated. The horse shown in the photo was hung from 30-ft. lengths of chain, which gave a tremendous sweep.

—Dale R. Van Horn, Lincoln, Nebr.



Kit to Carry Small Cans and Tools from Paint Bucket

When trimming windows while standing on a ladder, an empty gallon paint pail with the sides cut out makes a good kit for carrying putty, cans of paint and small tools. The kit can be suspended from a ladder rung.



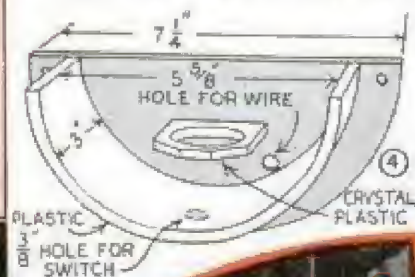
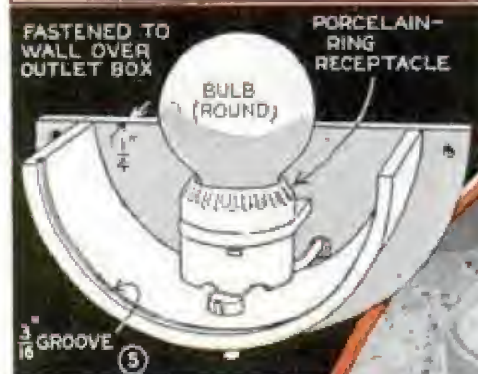
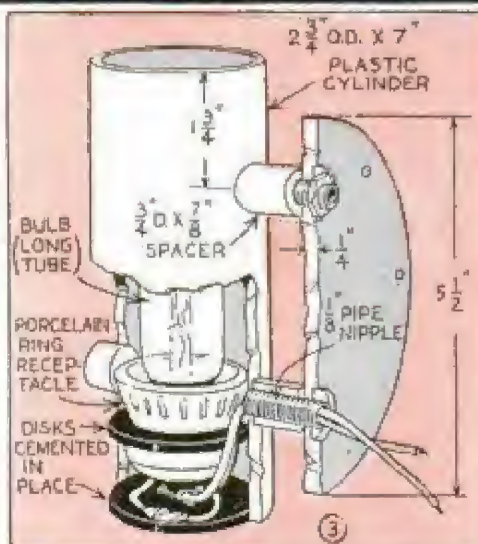


LIGHT UP

PLASTIC cylinders, obtainable in various sizes and colors, can be converted readily into charming bracket lights. Figs. 1 and 2 are typical examples. The construction of the first of these is shown in Fig. 3. The coloring should be translucent, such as pink, rose or emerald quartz. A standard size of plastic rod is used for the spacers and for the two ornamental buttons on the front of the cylinder. The back-plate is sheet-plastic stock, although wood, smoothly enameled or lacquered, can be substituted. The lighting arrangement consists of a porcelain ring (sign) receptacle. This type of socket consists of two parts, which are screwed together through a $\frac{1}{8}$ -in. plastic disk cemented inside the cylinder. A similar disk seals the lower end and also provides a mounting for the small rotary canopy switch. The bulb is of the tubular type, 6 in. long.

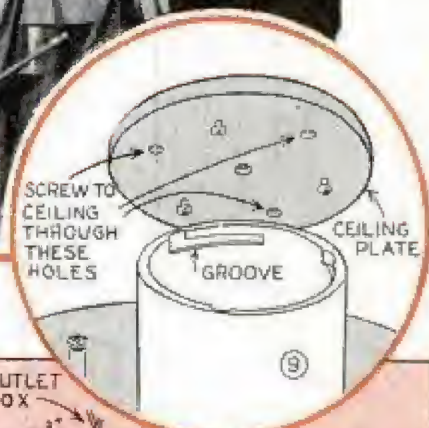
Figs. 4 and 5 show the construction of the second bracket light. A half cylinder of

plastic is mounted to a plastic wall plate, using cement and drive screws. Fastened to the back-plate is a small ledge of crystal plastic, cut out in the center to accommodate the sign receptacle.

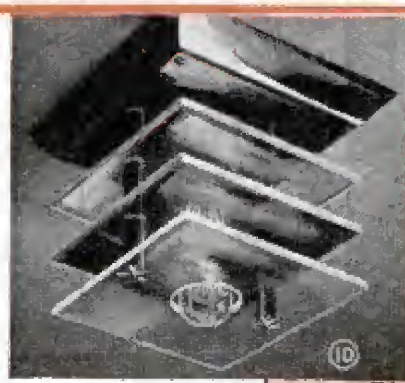




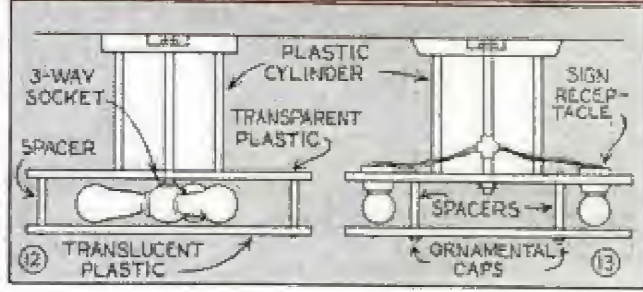
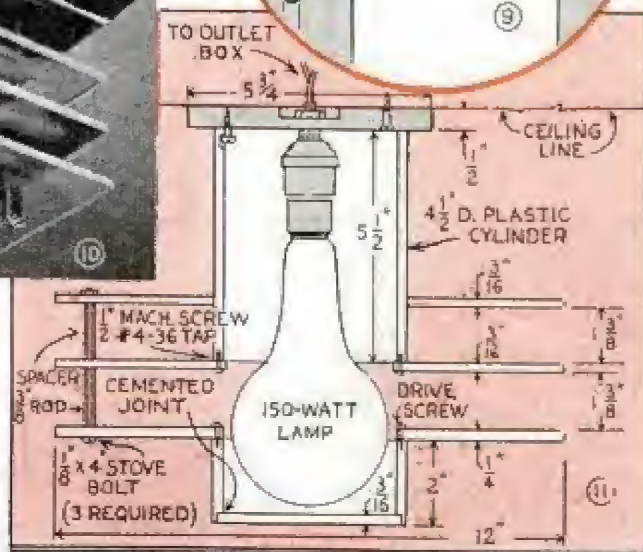
With These Colorful FIXTURES

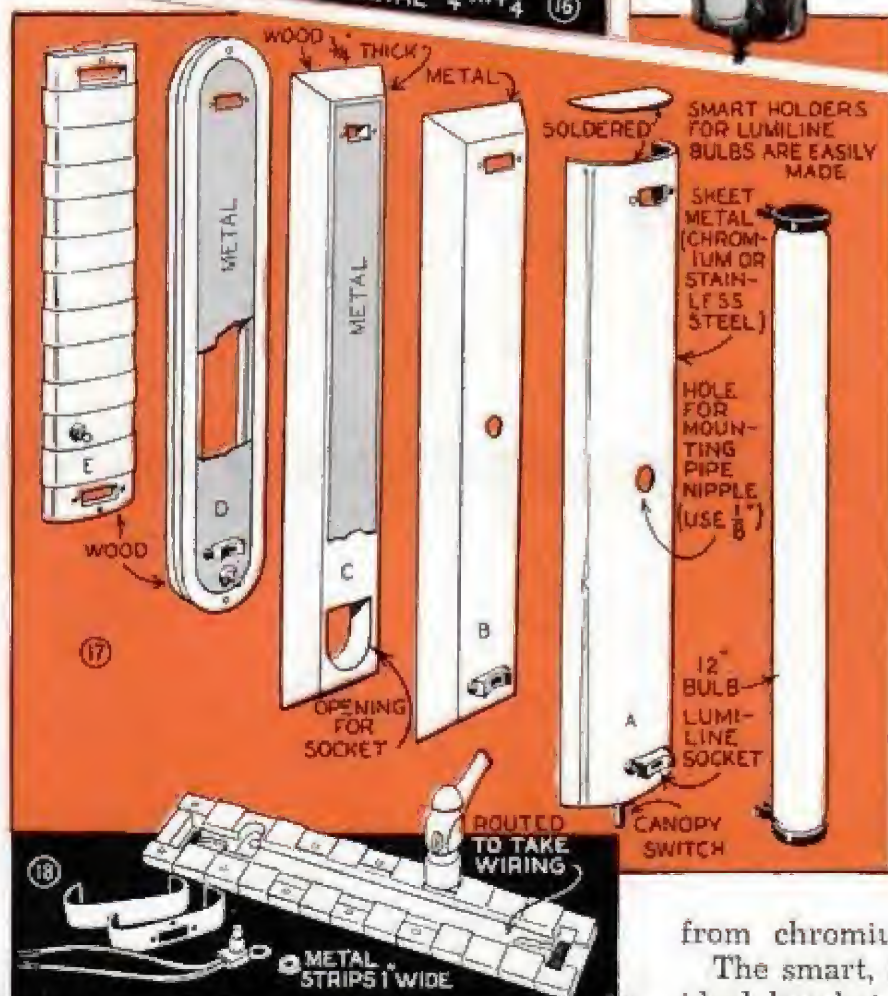


A disk of $\frac{3}{16}$ -in. rose quartz, which fits into a groove cut in the cylinder, completes the construction. The groove for the disk is easily cut with a small shaper cutter on the drill press, as shown in Fig. 6.



Disks cut from sheet plastic make up nicely for both large and small ceiling fixtures. The one shown in Figs. 7 and 8 uses a $4\frac{1}{2}$ -in. cylinder and three 12-in. disks, the assembly being made as shown in Fig. 11. The cylinder is pink quartz, as is also the bottom ring. The second ring is ruby and the top ring is sapphire (both of these are transparent). The unit is mounted to the ceiling plate by means of three screws, which fit corresponding grooves cut in the top of the cylinder, as shown in Fig. 9. Other attractive lights on the same order can be made, as shown in Figs. 12 and 13. Fig. 12 uses the same cylinder as before and has two rings,



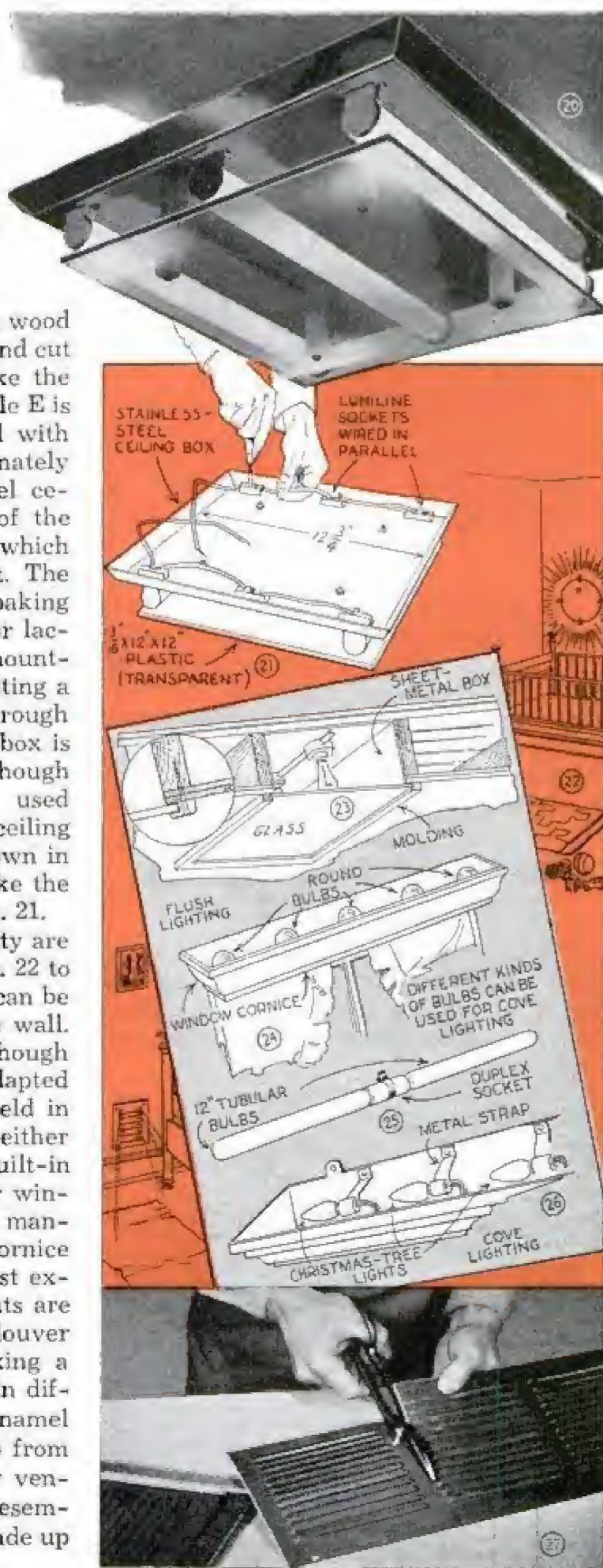


the bottom one being translucent while the upper one is transparent. A 1/8-in. pipe fitting through the unit serves as a support and also connects to a 3-way socket. The light shown in Fig. 13 can be made with either three or four lights around the edge of the plastic ring. The bottom disk is held in place with ornamental caps as it must be removed to permit changing bulbs. Fig. 10 shows a small hall light made from three squares of plastic—crystal, ruby, and crystal. The ceiling plate is a sheet-metal box made from chromium or stainless-steel stock.

The smart, new "Lumiline" bulbs make ideal bracket lights for the bathroom or kitchen and can be used also in other rooms. These bulbs are obtainable in 12 and 18-in. lengths, the ones shown in Fig. 14 being the shorter type. The socket consists of two parts—a cap which fits over the end of the bulb, and a receptacle into which the prongs of the cap fit. A socket is required at each end of the bulb. Fig. 17 shows various wall plates which can be made to accommodate these bulbs. The one shown at A, Fig. 17, can be made from chromium or stainless-steel sheet metal,

the end caps being soldered in place. Style B is also all-metal, and is cut according to the dimensions given in Fig. 16, which also show the correct dimensions for any other style of wall plate. Style C is a wood plate, cut out to accommodate the sockets and wiring, and covered on the face with sheet metal cemented in place. Stainless steel with fiber backing is ideal for this purpose. Style D is a wood frame, molded at the edges, Fig. 15, and cut out and routed in the center to take the sockets and a sheet-metal plate. Style E is a wood frame, shaped and grooved with molding head knives, and is alternately banded with strips of stainless steel cemented and tacked in place. All of the units use a rotary canopy switch, which can be mounted at any suitable point. The best finish for the wood brackets is baking enamel, although ordinary enamel or lacquer can be used. The units can be mounted with either an ornamental cap fitting a $\frac{1}{8}$ -in. pipe nipple, or by screws through the bracket. In all cases, the outlet box is immediately behind the fixture, although exposed lampcord wiring can be used in places permitting it. A simple ceiling fixture employing three bulbs is shown in Fig. 20. The ceiling box is cut to take the six receptacles wired in parallel, Fig. 21.

Lighting styles of current popularity are flush, cove, and louver lighting, Figs. 22 to 27 inclusive. The flush type of light can be fitted to either the ceiling or to the wall. Frosted or opal glass can be used although $\frac{1}{8}$ -in. translucent plastic is better adapted for intricate shapes. The glass is held in place with a suitable molding in either plastic or chromium. Cove or built-in lighting can be used above doors or windows, or in a vertical bank flanking mantels or bookshelves. The window cornice is perhaps the most popular and least expensive style to install. Louver lights are similar to flush lights except that a louver plate is used instead of glass, making a more shielded light. Louver plates in different sizes and in chromium or enamel finish can be purchased or made up from sections of enameled metal-window ventilators, as in Fig. 27. Other styles resembling small venetian blinds can be made up readily, and can be made adjustable.



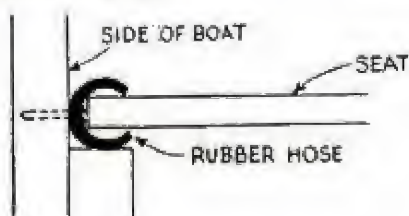
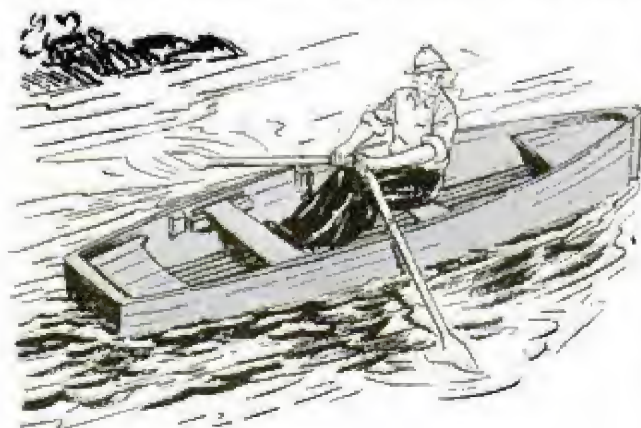
Hook on Folding Lawn Chair Prevents Collapse



Some types of folding lawn chairs have a tendency to collapse if the weight of the occupant is shifted forward causing the rung to slip out of the notches. To avoid this trouble, use a screen-door hook and screw eye as indicated. If the adjustment of the chair is changed often, a separate screw eye can be provided at each notch.

Boat Seat Is Easily Adjusted in Split Rubber Hose

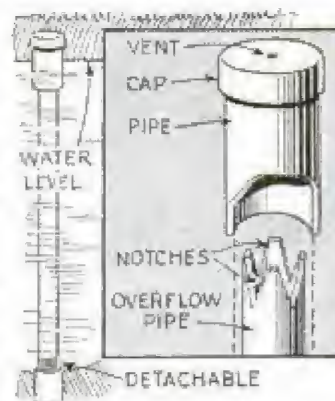
To adjust the seat of a rowboat easily so that persons of different height may row conveniently, cut two lengths of rubber hose, slit them along one side and nail



them inside the boat just above the cleats that support the seat. By fitting the ends of the seat into the slits, it will remain securely in place under the weight of the rower. When the weight is removed, the seat may be slid back and forth.

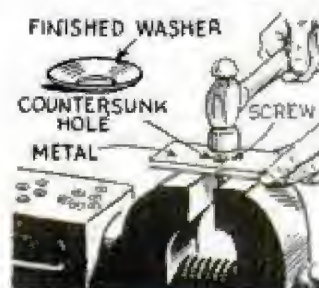
Non-Clogging Overflow Pipe in Garden Pool

If the overflow pipe in your garden pool has a tendency to clog, notch the upper end of the pipe and slip over it a nipple fitted with a pipe cap as shown. The nipple diameter must be about $\frac{1}{2}$ in. larger



An air vent is necessary in the cap to prevent the nipple-and-cap assembly from acting as a siphon.

Making Cup Washers



Small cup washers can be formed easily for use under flathead bolts when the holes have been countersunk too deep, or for protecting wood parts where

flathead screws are removed frequently. Just drill and countersink a hole in a piece of metal and rest it over the slightly opened jaws of a vise. Then place a flat washer over the hole, insert a flathead screw and drive it down with a hammer.

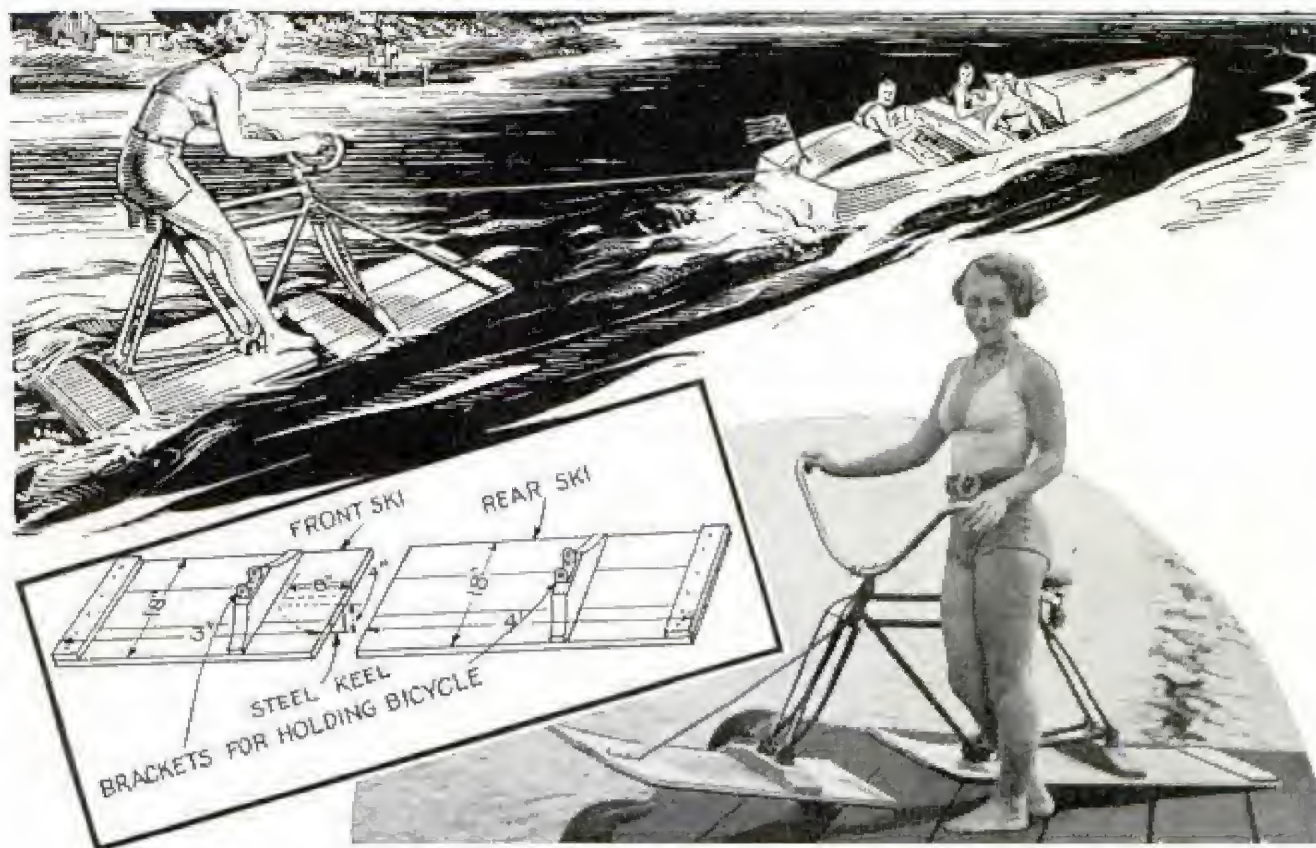
Shield for Lathe Spindle

To protect the threaded end of a lathe spindle from dirt and damage, a short rubber hose may be slipped over it. A piece of ordinary garden or radiator hose is satisfactory for the purpose.



—Howard R. Heydorf, Missoula, Mont.

"Bicycle Aquaplane" Is a Real Skill Tester

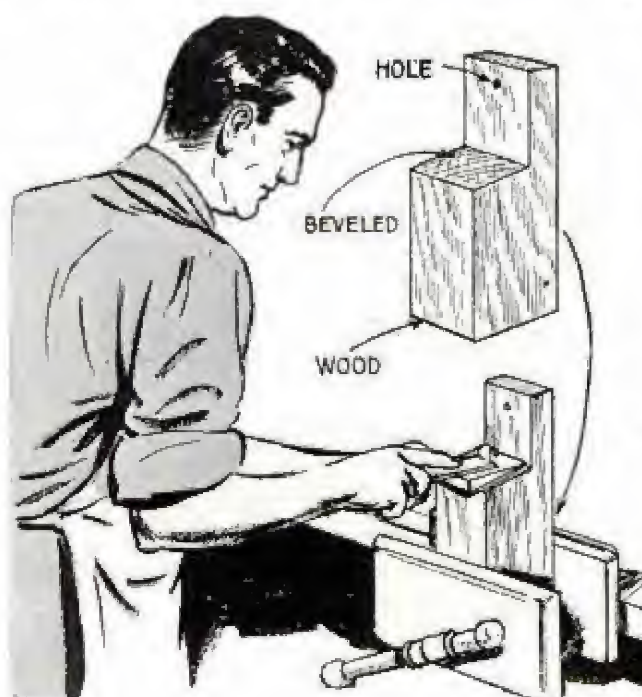


This bicycle aquaplane will provide great water sport and test your skill to avoid a ducking. Nothing more than an old bicycle frame fitted with wide skis, the aquaplane can be towed at a good clip behind a motorboat once you have mastered the art of

riding it. The skis are pivoted to the bicycle forks and are braced rigidly to hold them at the desired angle. A 4 by 8-in. steel keel located at the rear of the front ski is an aid in steering.

—Carlton Groat, Peach, Wash.

Small Wedges Can Be Shaped Easily in This Wooden Jig



Holding small pieces of thin stock to make small wood wedges is an easy job with this simple jig, which is made from a thick block and is clamped in a vise. The shouldered portion is beveled slightly to provide a good working angle, and a hole near the top permits the jig to be hung up.

—John A. Van Dusen, Delmar, N. Y.

Preserving Magazine Pictures

Pictures and paintings printed in magazines and newspapers can be given the appearance of oil paintings for framing by applying a coat of amber-colored sealing wax. This is dissolved in denatured alcohol to produce a mixture of about the consistency of molasses. Spread this over the picture and press cheesecloth against the tacky surface for a couple of minutes.

Irons to Brand Wood Articles with Name or Initials

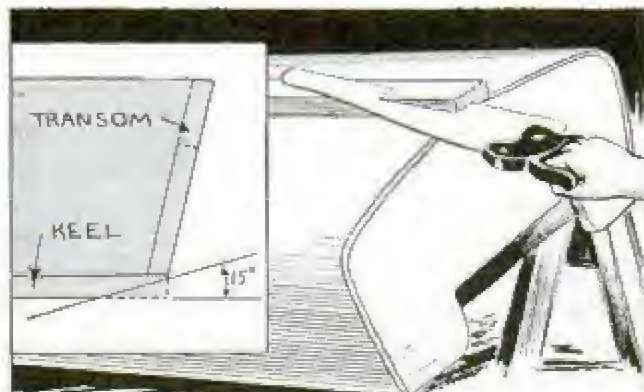


Anyone can make up these simple branding irons to burn names, initials or other data on wood articles such as beach chairs, camp stools, etc. The irons can be bent from 18-ga. iron wire, leaving one end projecting to serve as a tang for a wood handle. They can be made up as single letters or as complete names.

—B. Lifshy, Jackson Heights, L. I., N. Y.

Eliminating Spray at Stern of Boat

While experimenting with 16 to 33-hp. outboard motors mounted on large free-running and planing boats of different types, one manufacturer found that spray at the stern, which interfered with motor operation at times, was caused by the keel. The spray was evident only on boats

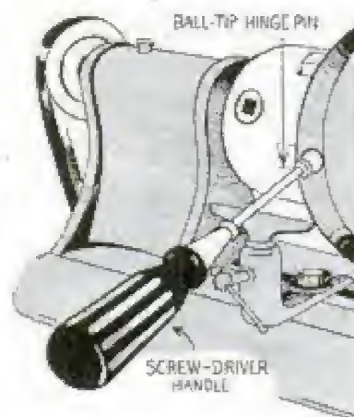


where the full depth of the keel extended to the extreme rear end of the boat. To eliminate this trouble, the keel was tapered at the transom as indicated.

Round-Nose Spinning Tool from Hinge Pin

Having occasion to spin a concave edge on several copper disks, I improvised a smooth round-nose tool from a large hinge pin by fitting it with an old screw-driver handle. The surface on the ball tip produced a mirror-smooth finish on the work.

—V. L. Howard, Evanston, Ill.



Funnel Vented with Cotter Key



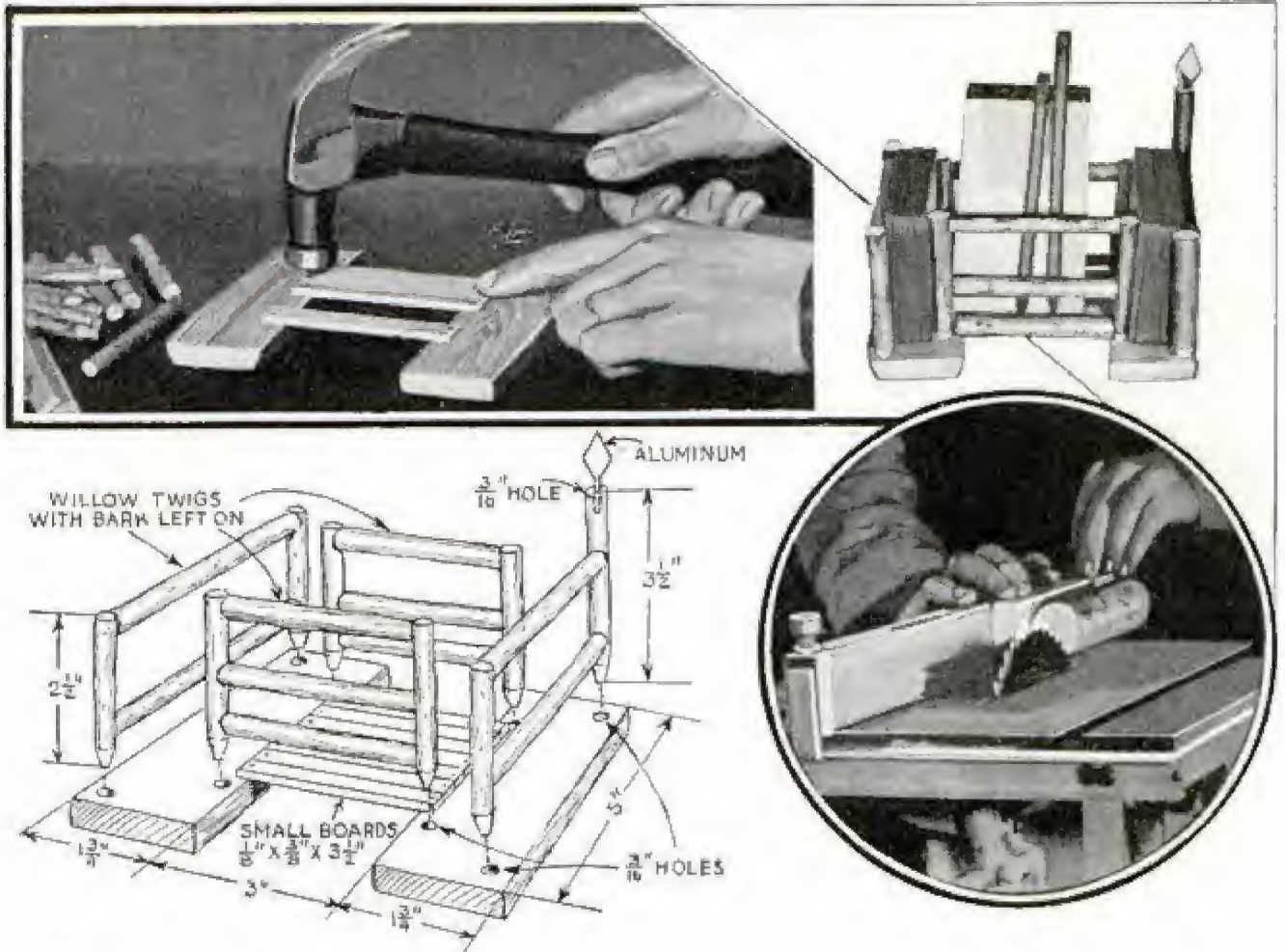
To fill small bottles with a funnel when the spout fits so snugly that air cannot escape, slip a cotter key over the edge of the spout. This will provide a space between the funnel and bottle neck and the key will remain in place without attention.

Hand Pencil Sharpener Fitted with Shavings Receptacle

A small hand pencil sharpener can be fitted with a receptacle to catch the shavings by attaching it to the screw-type lid of a small jar such as a face-cream jar. Just drill a hole in the lid, large enough to take a pencil, and attach the sharpener on the underside of the lid in line with the hole.



Rustic Bridge Set Has a Trump-Suit Marker



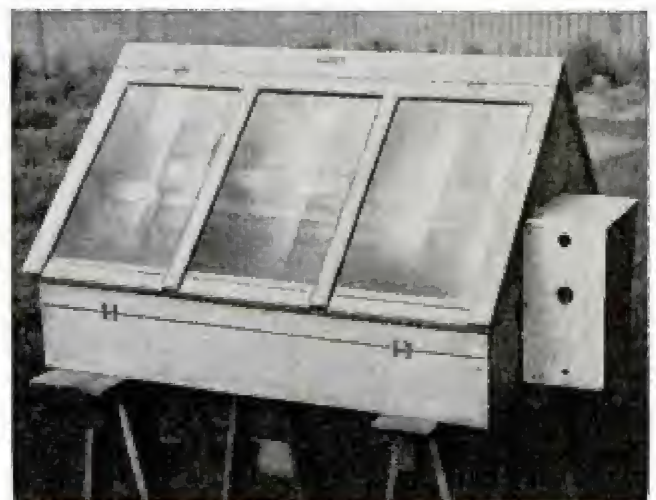
In this little bridge set there are compartments for pencils, score pads, two decks of cards and there is even a trump marker, which is stuck in one of the posts to serve as a reminder of the trump suit for each hand. The signs are aluminum cut-outs of each suit in the deck. The set is made of willow sticks $\frac{1}{4}$ to $\frac{3}{8}$ in. in

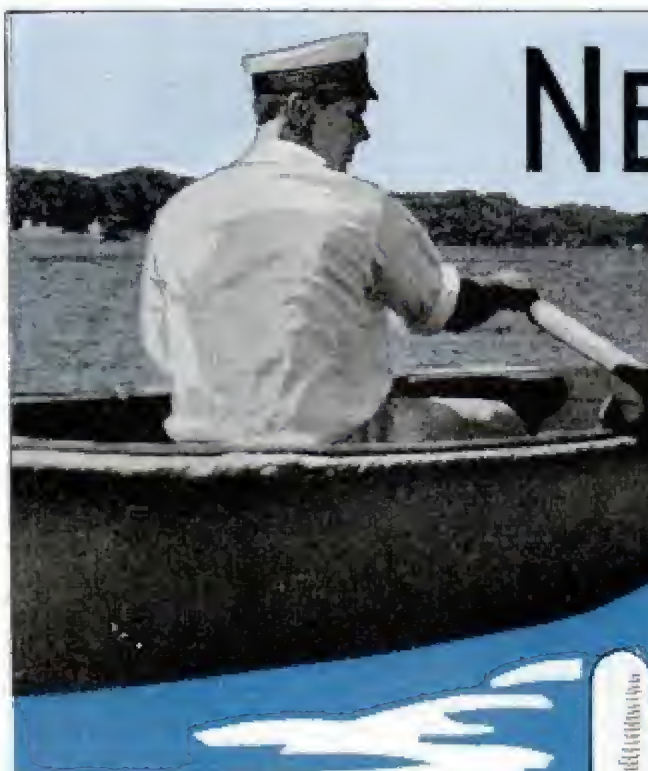
diameter, which have been dried with the bark on. If desired, the two base pieces can be ripped from a large willow branch so that bark will be on the edges to carry out the effect, or you can use other stocks. Be sure that all the wood is well dried so that the set will not shrink and pull apart at the joints. Finish with clear varnish.

Electric "Hotbed" Assembled from Parts of Egg Incubator

Using the water coils, heating unit and thermostat of an old electric incubator, a home owner improvised this hotbed or seedling starter in which more than 1,000 plants of various kinds were started so that they matured two weeks early in the garden. The box was built to take the coils and to accommodate a number of individual trays on a shelf and the bottom. The glass sides admit sunlight and protect the plants against low temperature.

☛ Stand on a thick rug when washing or ironing and you will not tire so easily.





NEW CANVAS

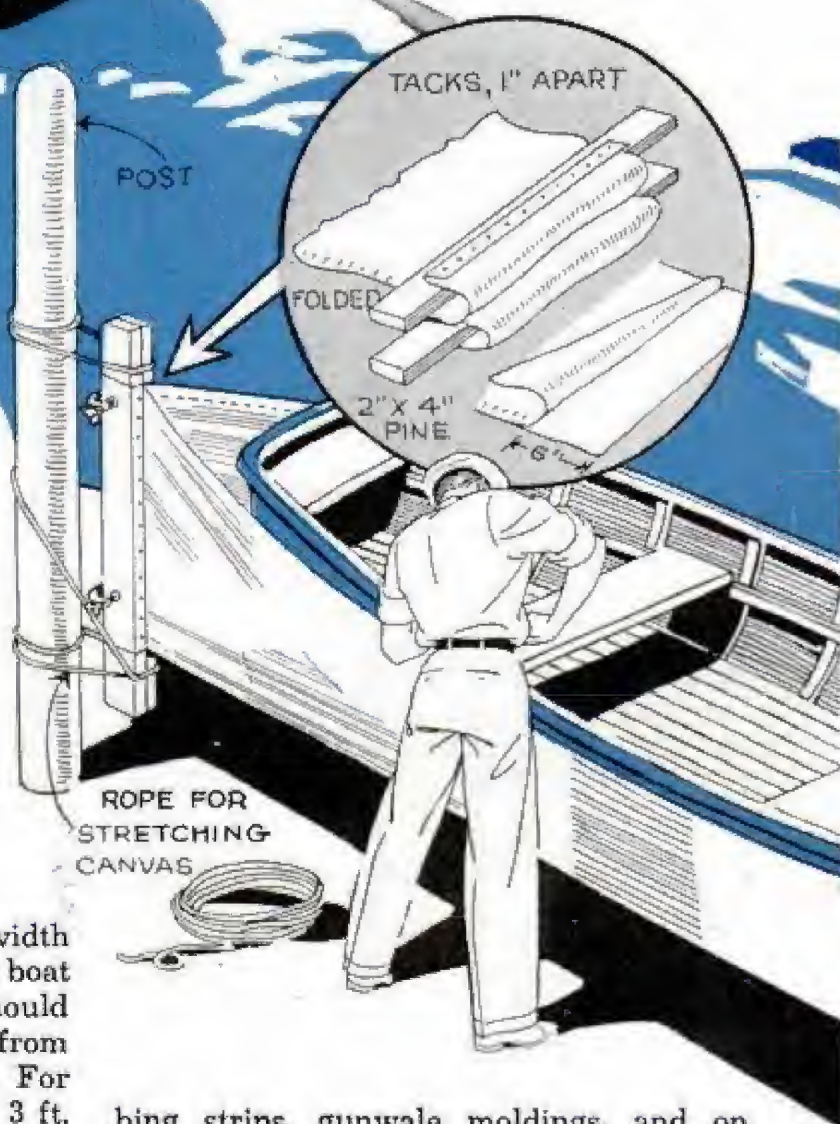
Old canoes and dinghies recovered simply by dropping them into a one-piece canvas "hammock" and tacking at stem and transom

By W. E. STEWART

WHEN your canvas-covered dinghy or canoe was new the covering was made from a single piece. When replacing that worn-out covering, the proper thing to do is use another single piece of canvas. By employing the single piece as compared with two pieces usually applied, you will eliminate the risk of leaks which are likely when a seam runs the entire length of the keel.

Your craftsmanship is the greater part of the job so it is well to select only the best of materials. The canvas, or duck, as it is known commercially, should weigh about 14 oz. to the square yard. Purchase it in a width at least 6 in. wider than the girth of the boat amidships. For a dinghy the length should be about 5 ft. more than the distance from transom to forward part of the stem. For a canoe, the canvas should be about 3 ft. longer than the over-all length. You will require about $\frac{1}{4}$ lb. of $\frac{1}{4}$ -in. copper tacks for fastenings. For setting, filling and preserving the canvas use white lead and boiled linseed oil. You will need about $12\frac{1}{2}$ lbs. of white lead and $\frac{1}{2}$ gal. of oil.

First prepare the dinghy or canoe for the new covering. The stem piece, keel, rub-



bing strips, gunwale moldings, and on dinghies, the outer planking of the transom, are held in place by screws started from the outside. Remove these carefully, Fig. 1, and put the woodwork in first-class condition for re-use later. Place the bent pieces in positions which will preserve the curvature which they have as they come from the boat. Now strip off the old canvas

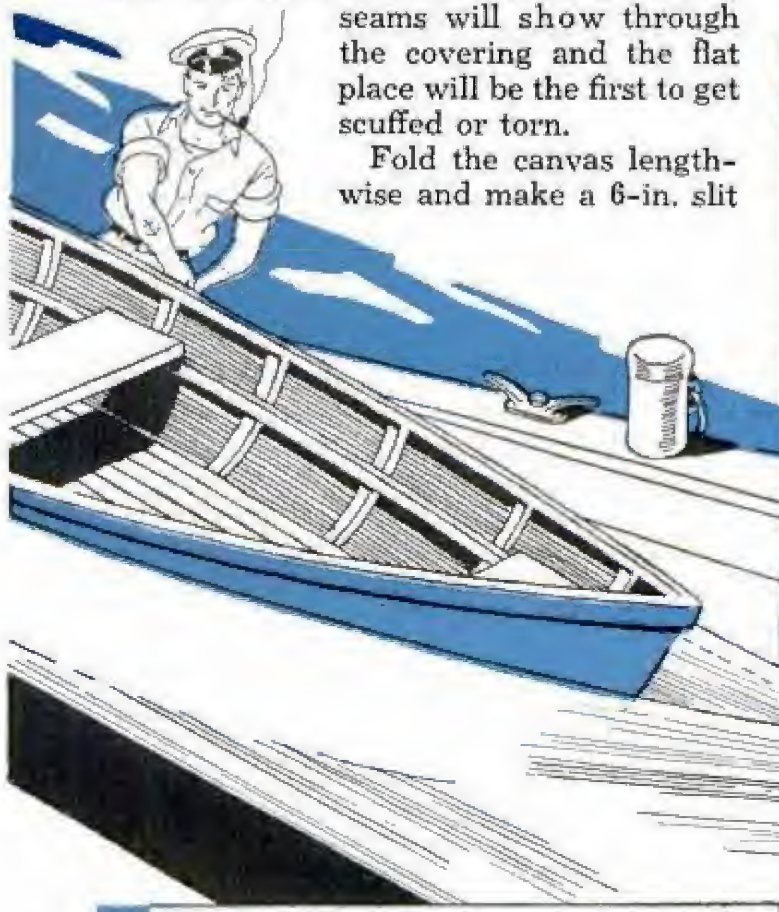
ON OLD BOATS

and pull out the old tacks which held it in place. Observe carefully how the folds of canvas at the transom and the lap joint at the bow have been made, as you will have to duplicate them when putting on the new cover.

Carefully inspect the entire hull for dry rot, loose fastenings and broken planks and ribs, Fig. 2. Dry rot can be corrected only by replacing the wood which is affected, but you will find it entirely feasible to replace only a small portion of any plank or rib in this type of boat. Replace loose fastenings, pins, screws, etc., with longer ones or with some of larger diameter, Fig. 3. Finally, use a plane and sandpaper block on the hull to restore a perfectly smooth, curved surface. Remember that no part of the surface of the hull should be flat. If all parts are not smoothly curved,

seams will show through the covering and the flat place will be the first to get scuffed or torn.

Fold the canvas lengthwise and make a 6-in. slit



1 REMOVE STEM AND KEEL AND THE OLD CANVAS

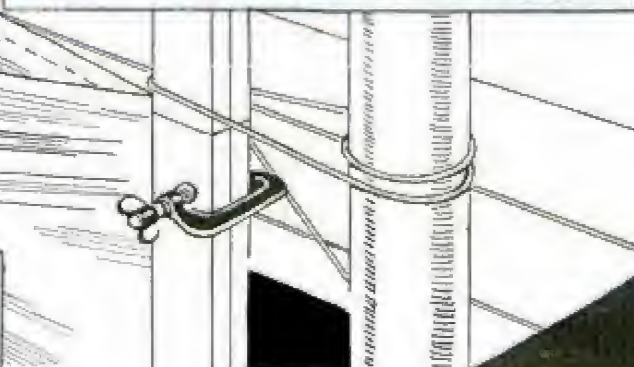


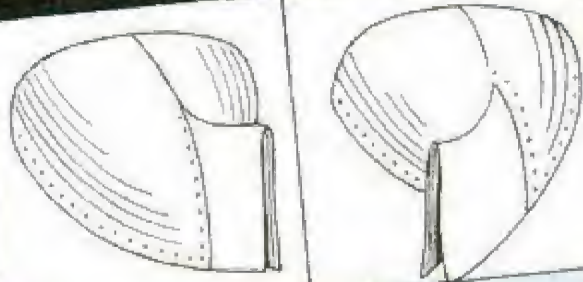
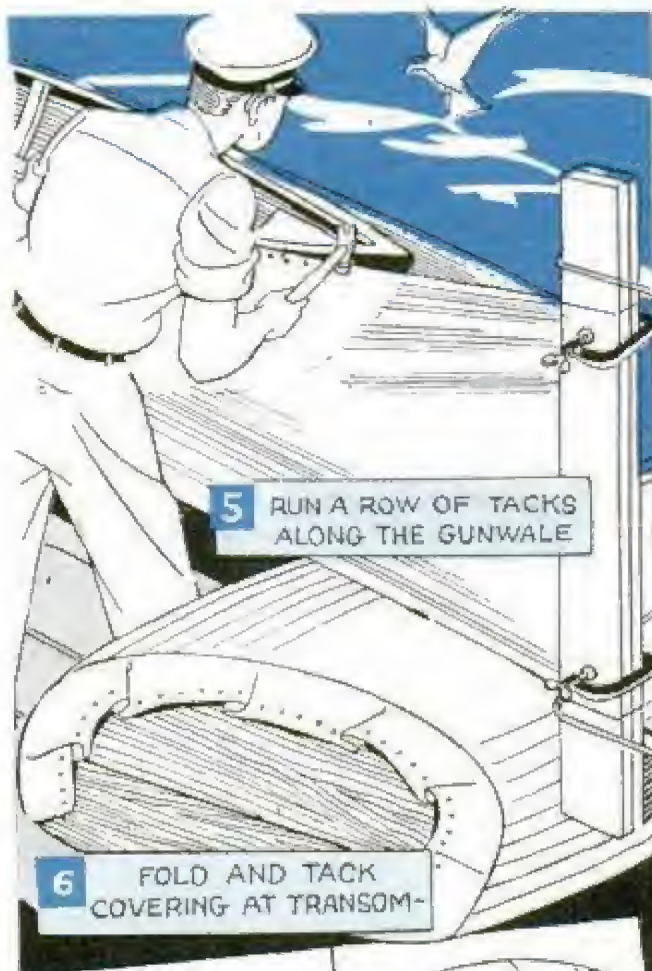
2 CHECK PLANKING FOR DRY ROT AND PATCH WITH NEW STOCK



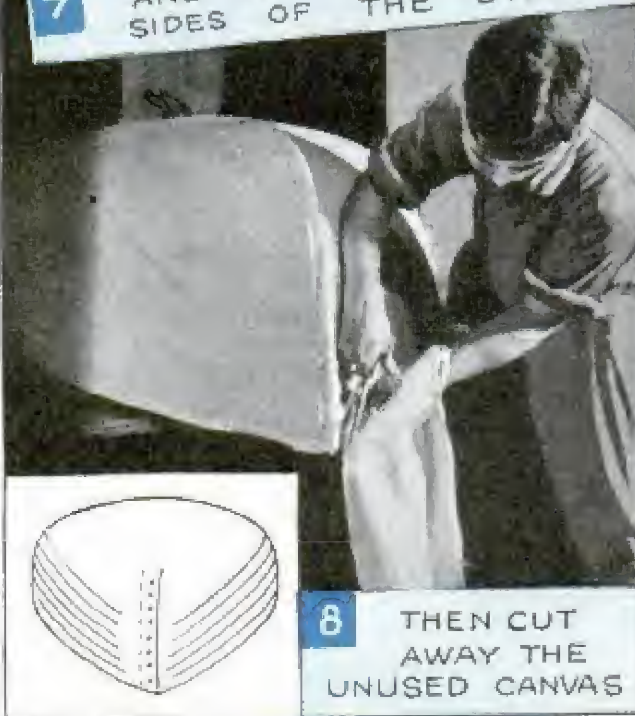
3 REPLACE WEAK FASTENINGS AT STEM AND TRANSOM

4 THEN STRETCH THE CANVAS "HAMMOCK" AND LOWER THE BOAT INTO IT





7 AND TACK ON BOTH SIDES OF THE STEM



8 THEN CUT AWAY THE UNUSED CANVAS

in the crease at each end. Tack the extreme ends of the canvas to four 2-by-4-in. scantlings, as shown in Fig. 4. The three-fourth turn shown is sufficient to absorb the tremendous strain which later will be placed on the canvas. Clamp each pair of scantlings together so that the canvas is held between them and stretch the canvas between two rigid supports such as posts in the cellar, corner frames in a garage, or two large trees, and secure with ropes. Take up the ropes so that the canvas will be stretched almost rigid. You may further tighten the ropes by covering them with water-soaked cloths.

After stretching, the upper edges of the canvas may be pulled apart a distance of 2 ft. Lower the dinghy or canoe into the pocket, right side up. With someone's help on the opposite side, work the boat down into the envelope of canvas. As it approaches its final position have a third person sit in the boat to give it added weight. Wet the canvas after the boat has been pushed well down into it. This shrinks the fabric to conform to the shape of the boat.

Start tacking the canvas to the boat at the gunwales. Drive a few tacks amidships, then start working toward the stern, alternating at 6-in. intervals from one side of the boat to the other, Fig. 5, and each time work the canvas up tightly and smoothly from the keelson. When you have reached the stern, begin again amidships and work toward the bow. This half of the boat will be more difficult to sheath smoothly, as the canvas must be distorted more. However, by working the canvas up firmly from the keelson and securing each place as you go, you will be able to get a perfectly smooth fit. Canoes are a much simpler problem than dinghies as the change in shape of the boat is less acute. In a canoe it makes no difference which end is finished first. At a point about 12 to 18 in. from the stem of either canoe or dinghy, you will find that the angle of the canvas is such that it no longer bears against the hull. When both sides have been secured to this point, remove the stretchers and invert the boat on a pair of sawhorses, or boxes, to complete the work. On a dinghy, cut off the excess canvas about 6 in. beyond the transom, pull the flap tightly over the edge of the transom and tack it down, Fig. 6. It will be neces-

sary to make a number of overlapping folds to get the canvas to lie smoothly on the transom. Do not cut out any of the cloth to eliminate the necessity for folds; its continuity is additional insurance against leakage.

Return now to the bow. At the point where the stem begins to curve away from the keel, let the canvas extend straight on. Work the canvas smoothly against the sides of the bow, allowing the surplus to accumulate both beyond the gunwale and at the keelson. When this has all been made smooth and tacked on each side all the way to the stem, Fig. 7, dispose of the excess along the keelson and stem. Pull this tightly over to one side and set a row of tacks into the stem about $\frac{1}{2}$ in. off center. Next, pull the canvas over to the other side and run a similar row of tacks along the opposite side of the stem. Then trim off the excess canvas, but leave enough material on each side to make an overlap of about $1\frac{1}{4}$ in., Fig. 8. Before tacking down the overlap, paint the wood underneath and the two flaps of canvas liberally with white lead and boiled linseed oil. The mixture should be of the consistency of heavy cream. At the end of the cut in the canvas make a small tapering fold to keep it taut on the hull. When the keel is added, this fold will be covered completely.

A number of commercial canvas fillers are available, and most of these will give a smoother finish in fewer coats than will white lead and boiled linseed oil, but nothing is more durable or economical than the latter. Mix white lead, 6 lbs., with boiled linseed oil, 1 qt. Be sure that the oil is boiled, not raw, as the latter practically never dries. Paint every bit of the canvas with the mixture, not excluding the part which is folded over the transom. Allow this coat to dry very thoroughly, perhaps three or four days, before applying a second coat. When the second coat has dried, sand it down lightly with No. 4/0 sandpaper. Remove all lumps of paint but avoid raising the nap of the fabric underneath. When this is done you are ready to replace the outer transom planks, keel, outer stem and gunwale moldings, Fig. 9. Before fastening them, paint their undersides and the areas of canvas against which they bear very liberally with a creamy mixture of white lead and linseed oil. Wipe off any excess which may be squeezed out, then apply a coat of lead base, flat white paint to the entire exterior of the boat. Allow 24 hrs. to dry and paint with one coat of yacht white, semi-gloss paint as in Fig. 10. Replace the fender rope and painter.

9 REPLACE THE TRANSOM FACING



10 BRUSH ON THE LAST COAT OF SEMI-GLOSS PAINT



SHIPSHAPE AGAIN!



Ventilator Hinged in Center Is Easy to Handle



I find that a window ventilator hinged in the center is easier to handle than the regular sliding type because you just start the ends in place and push it. I made the one shown, using white-pine frames, which were covered with sheet iron with openings cut as indicated. Use butt hinges and screw them facing the outside.

—M. W. Kraynak, Scranton, Pa.

Wooden Duck Wings Its Way in the Garden



Ornamental for lawn or garden, this duck has wings that simply rotate but give a realistic impression of flying. An over-enthusiastic hunter even ridiculed this one before discovering his mistake. The

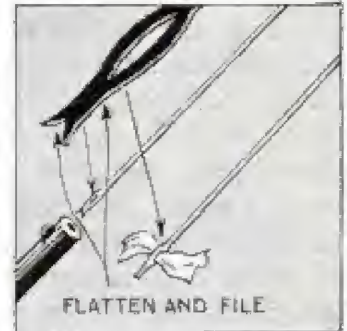
body of the duck is about 16 in. long and the wings were made from wide shingles. These were mounted at a slight angle on a bolt which runs through the body, small

flanges being used as bearings. Owing to the taper and pitch of the wings, they revolve in almost any wind from any direction and as the wings rotate the duck's body weaves from side to side.

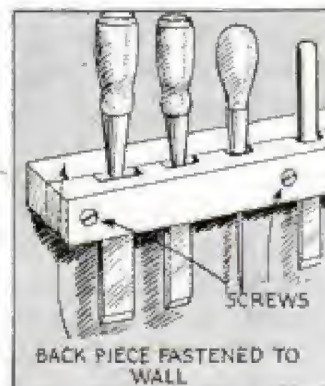
Notch in Gun Cleaning Rod Removes Patch from Barrel

When a cleaning patch became disengaged from the rod, one sportsman flattened the end of his rifle cleaning rod and then filed the flattened tip to make a two-tined fork.

With this implement, he removed the lodged patch by merely pushing the fork against the cloth and twisting so that the tines became entangled in the fabric.



Simple Rack for Small Tools

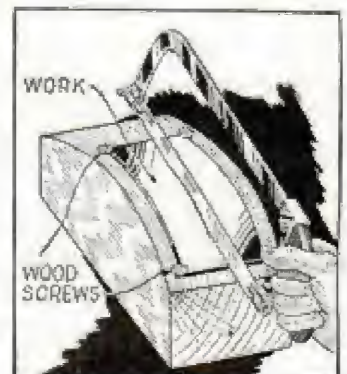


This rack for chisels, screwdrivers and other small tools permits easy rearrangement and additions when necessary. The back piece is fastened to the wall and only the front one is mortised to

receive the tools. You will find this method of making a rack simpler than boring or mortising holes in a single piece.

Cutting Closed Slit in Metal

In the absence of a circular slitting saw, a closed slit can be cut in thin sheet metal with a hack saw by bending it over a wood former. Screws driven into the former with



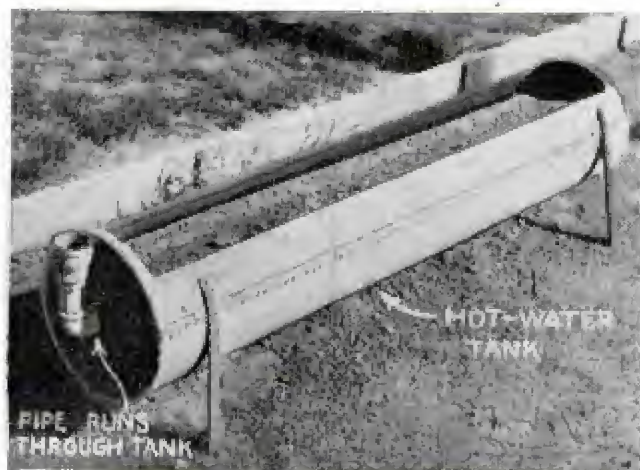
see July 1939 weather vane 131

similar. sold by Chicago. Harlow & Larich.

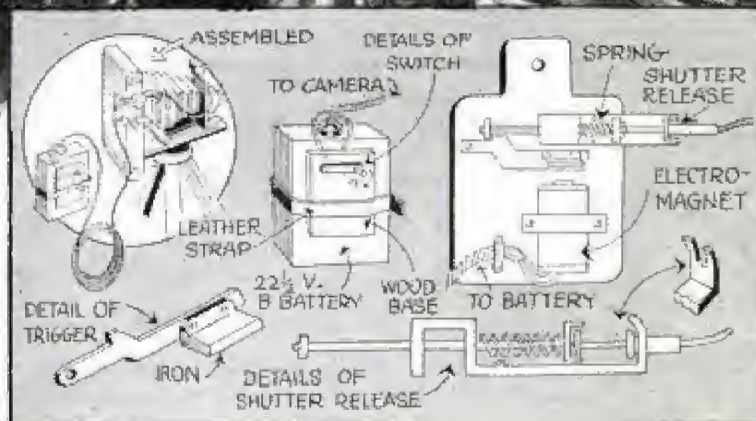
ing over the edges of the work will hold it in place. The curvature of the former will be governed by the thickness of the sheet and the length of slit desired. A single saw cut will give a narrow slit, or by using two blades in the same frame, a cut double the width will be made. Where a still wider slit is desired, drill a hole at each end of the proposed slit and make two cuts, removing the metal strip thus formed.—John Drummond, Edinburgh, Scotland.

Flower Box Watered by 'Underground' System

Made from an old hot-water tank, this flower box has a simple underground watering system that assures adequate moisture for the plant roots, and prevents caking of the top soil. A pipe having tiny holes drilled in it passes through the center of the tank lengthwise. An elbow and a reduction nipple on the end of the short vertical pipe outside one end of the tank act as a funnel for pouring in water.



Camera Is Controlled Remotely to Photograph Birds and Animals



Easy to carry and hook up, this electrical control for a camera shutter release enables you to set up the camera in the open and then hide some distance away to get a photo of a bird or wild animal. All you need is a 22½-volt radio B-battery, some insulated wire, a small electromagnet, which can be taken from an old doorbell, and a few small

pieces of brass. The arrangement and shape of the parts are shown in the details. When the switch on the battery is thrown current passes through the magnet and causes it to trip the trigger. This action releases the spring-loaded plunger, which snaps forward and pushes the camera shutter release.

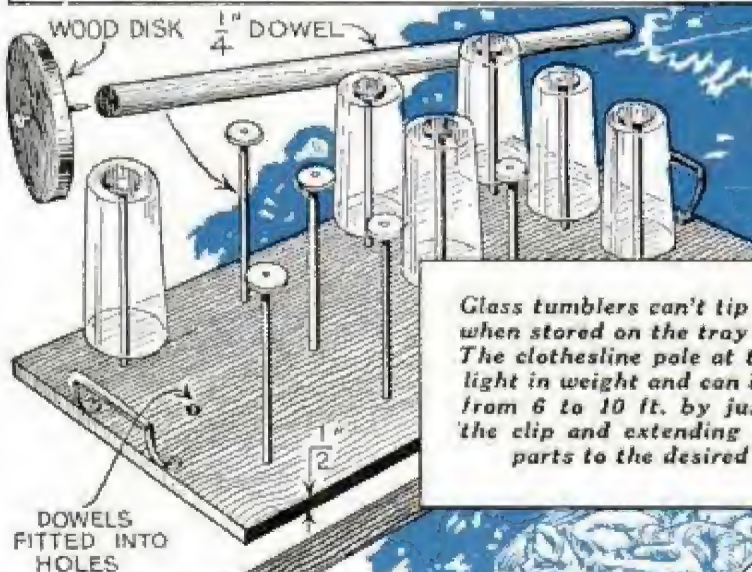
—Dwight Loudermilk, Caldwell, W. Va.

❑ Glass or aluminum pushpins provide attractive knobs for cupboard doors of light plywood. The points of the pins should be clinched to keep them from pulling out.

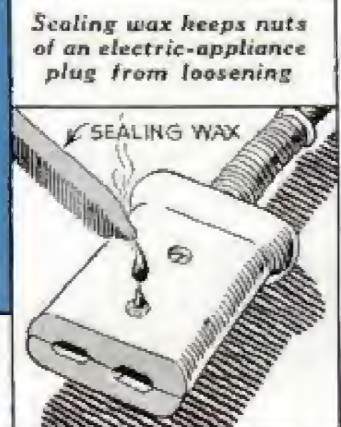
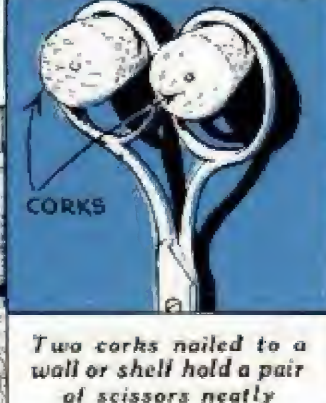
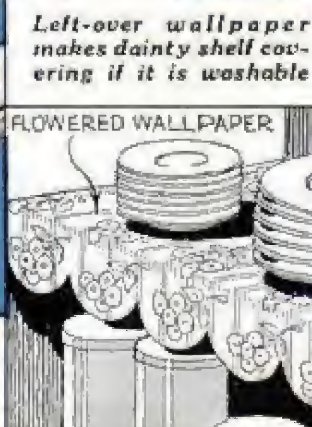
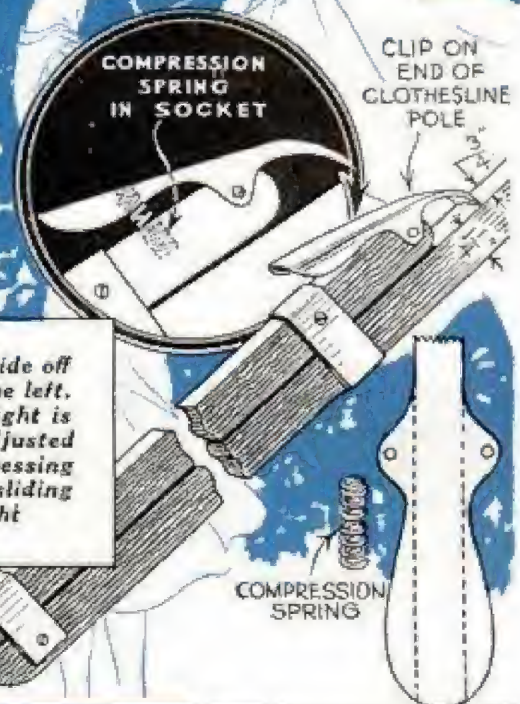
Solving HOME



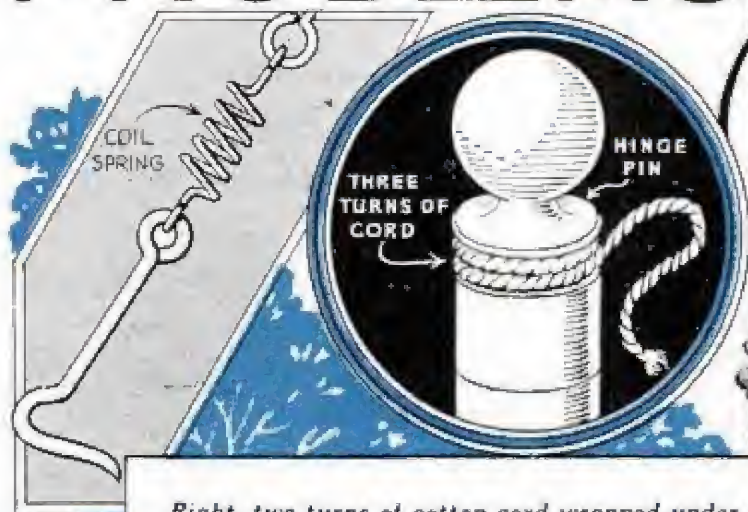
It's easy to grease a waffle iron by placing tissue paper soaked in hot lard between the grids while the iron is heating and again when storing it. Right, loss of stitches when knitting work is laid aside is avoided by slipping fuller balls over ends of the needles



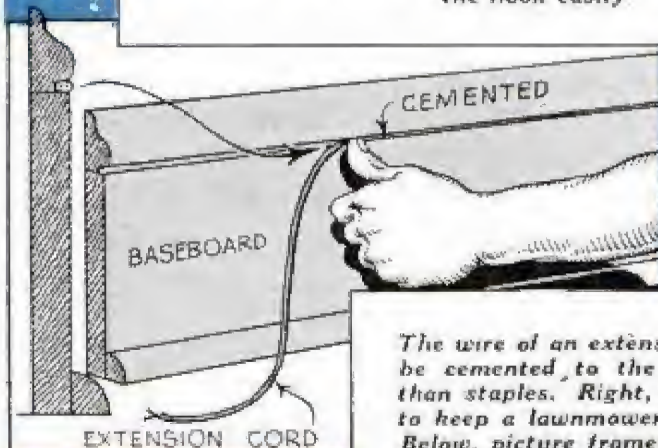
Glass tumblers can't tip or slide off when stored on the tray at the left. The clothesline pole at the right is light in weight and can be adjusted from 6 to 10 ft. by just pressing the clip and extending the sliding parts to the desired height



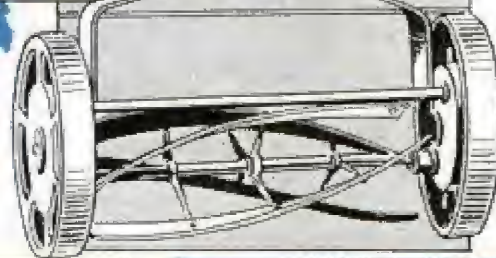
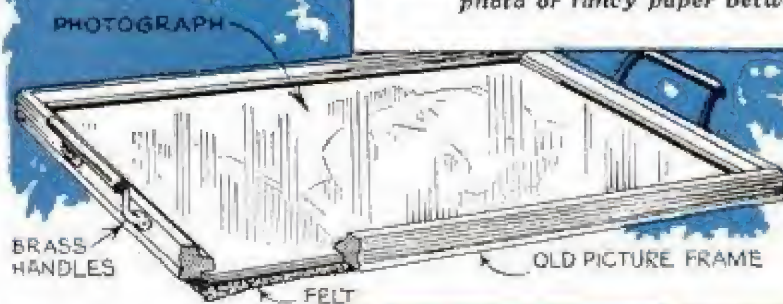
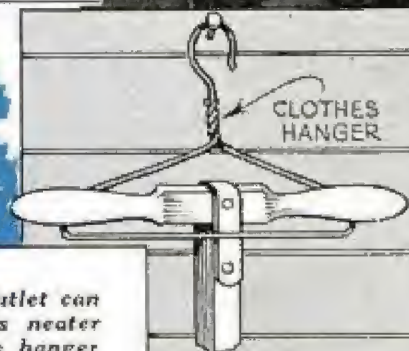
PROBLEMS



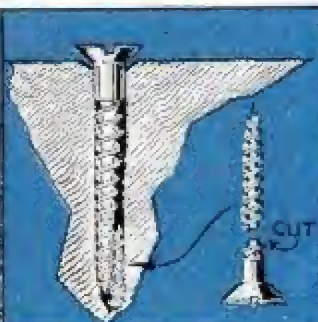
Right, two turns of cotton cord wrapped under hinge pin and kept oiled furnish lubrication and eliminate squeaks. Attach a screen-door hook with a small spring as above and it will hold the door snugly and allow enough flexibility to fasten the hook easily.



The wire of an extension electrical outlet can be cemented to the baseboard—it's neater than staples. Right, using a clothes hanger to keep a lawnmower handle against a wall. Below, picture frames converted to trays by adding a bottom of plywood and glass with a photo or fancy paper between them.

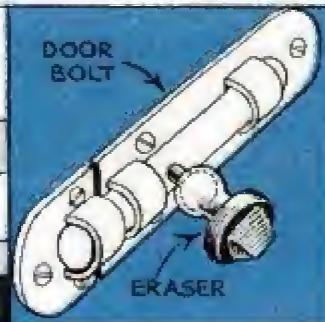
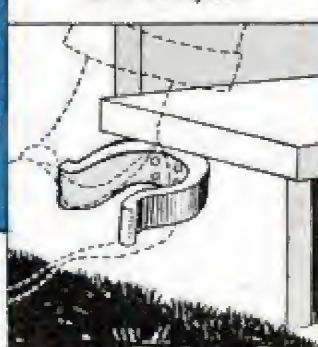


Rubber cap of electric-cord plug grips screw tops on bottles



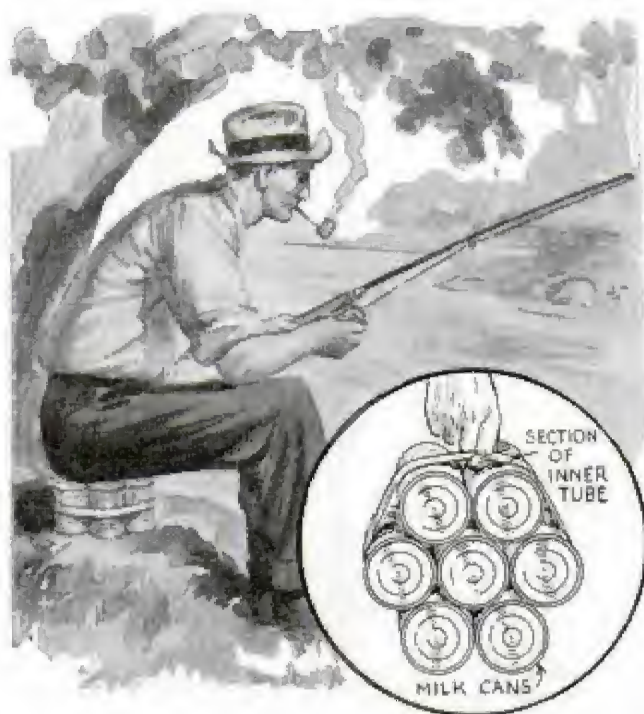
Portion of small screw makes larger one hold in oversize hole

Section of auto tire nailed to steps serves as a bootjack



Pencil eraser affords good finger grip on sliding door bolt

Fisherman's Seat Improvised from Tin Cans



If you dislike to sit on damp ground while fishing, gather up a number of tin cans of the same height and bundle them

together with a rubber band cut from an inner tube, to provide a seat as indicated. The seat is light and easy to carry and will not sink quickly if accidentally dropped into the water.

Hot Photoflood Lamp Removed with Paper Carton

When a photoflood or other lamp burns out and it is necessary to remove it immediately, use the empty paper carton of the new lamp to unscrew the hot one. The carton prevents burned fingers.



☛ Lipstick stains can be removed from white linen by soaking the cloth in strong vinegar; if the stain is on colored material, use equal parts vinegar and water.



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You need not be an expert with tools in order to make these simple houses. Any one of them can be sawed and nailed together in an hour or so. Ordinary grocery boxes and other scrap wood will do, although a material list is given if you have to purchase the wood.

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All five designs are fully dimensioned and complete instructions tell just how to proceed in doing the work. A fine opportunity for children to start making useful things with hand tools. Send ten cents and coupon for Craftplan No. 3005.



SHOP NOTES

Set of Lathe **DRILL PADS** *easily made*

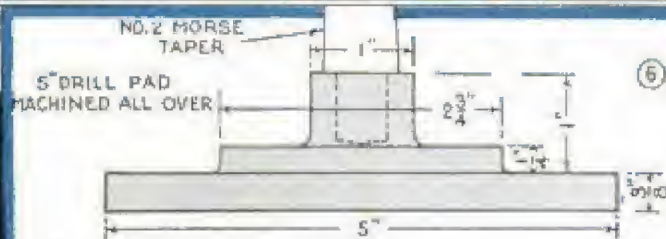
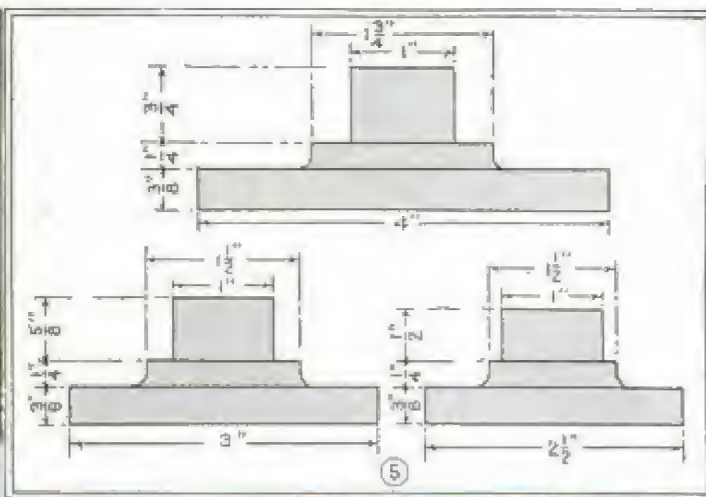
Fitted in a lathe tailstock spindle these accurately turned pads enable you to do precision drilling on a variety of work

By CHESTER W. WOODSON

THERE'S a definite advantage in making drill pads in sets for you are then able to handle a greater range of work. For example, if the object to be drilled is of fairly large size, Fig. 1, you can select a pad which will give sufficient brazing surface for adequate support of the material or part being drilled, and where you make the pads yourself it's an easy matter to adapt their range to your own work. Fig. 6 gives the general dimensions for a set of four pads adapted for use with a 9-in. lathe. Of course, if you should have special requirements, these sizes need not be followed closely. But whether made larger or smaller than the sizes given, it's a good idea to keep the proportions very nearly the same.

First of all, you will need to turn wood patterns as in Fig. 2. These should be turned from a close-grained wood such as maple, sanded smooth and given at least two coats of shellac. Allow $\frac{3}{32}$ in. all over for shrinkage of the casting and for machining. Also, it is necessary to bevel the edge and the center hub slightly





so that the pattern will draw from the mold. You can see this bevel on each of the three patterns in Fig. 2. When you take your patterns to the foundry, specify gray iron castings, for this material machines easily.

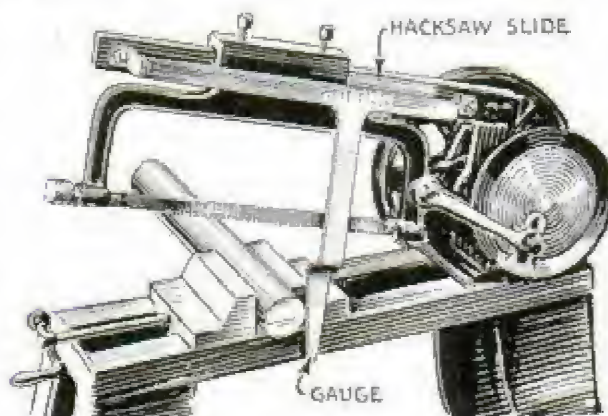
Center the castings in the lathe chuck with the hub out as in Figs. 3 and 7. Finish all over and bore for the No. 2 Morse taper shank. The latter can be made easily from a discarded drill bit by shouldering the shank to a force fit as indicated in Figs. 3 and 4, the latter showing how the Morse taper shank is forced into the hub of the pad with an arbor press. Of course, you

have to be very particular about measurements on the taper shank to get a proper force fit.

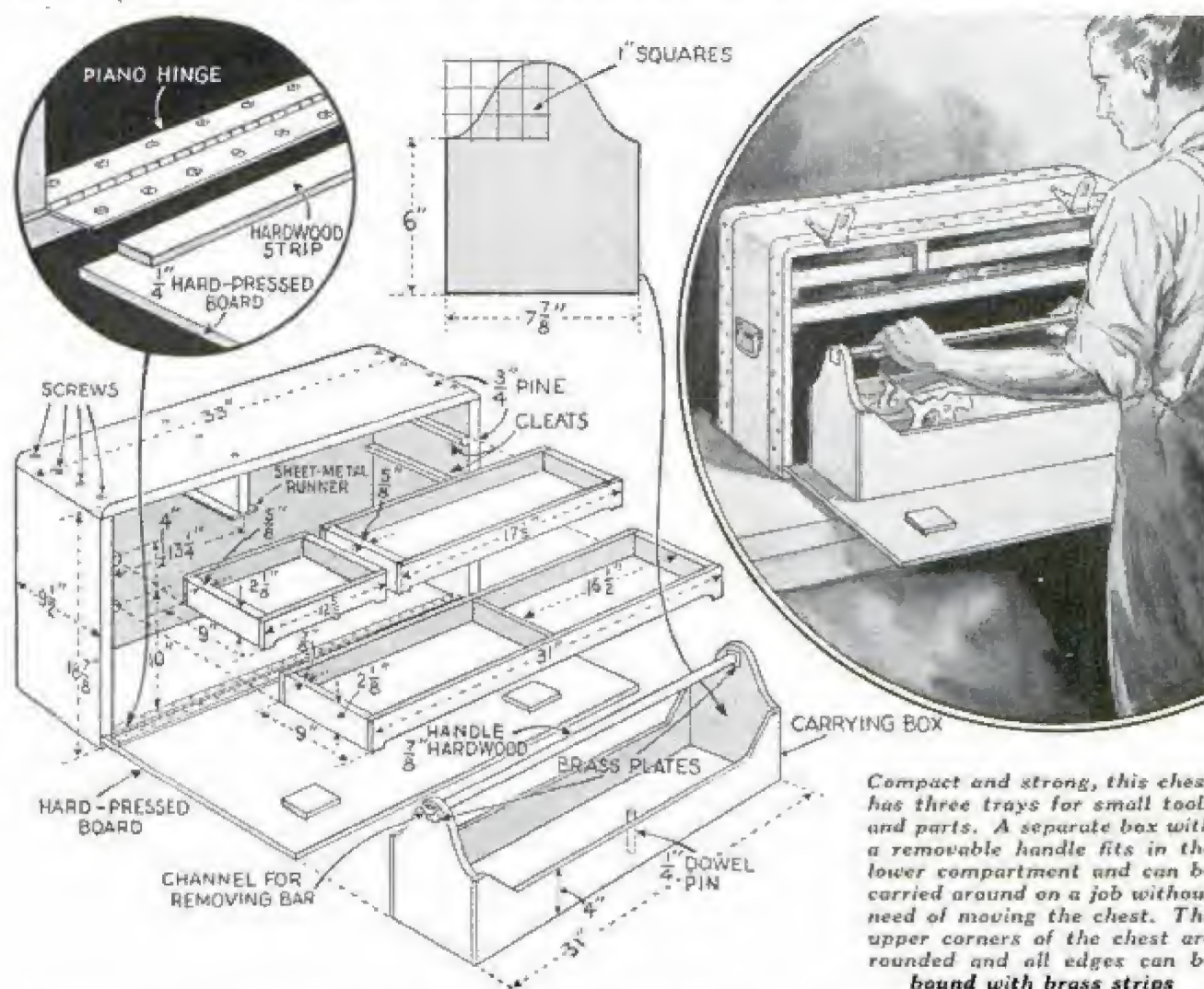
Finally, the chuck is removed from the lathe and the tapered shank of the pad inserted in the headstock spindle. Then you turn down the rim to the required diameter and true the face of the pad, finishing with a light, slow cut to give a smooth surface. Finish all four pads the same way.

Gauge Locates Work on Hacksaw

Cut from heavy sheet metal and screwed to the saw guide, this gauge enables you to locate work in the right position on a power hacksaw without lowering the blade. The lower end of the pointer must be bent so that it is directly in line with the blade, and the pointer must be located so it will not interfere with the full stroke of the saw.



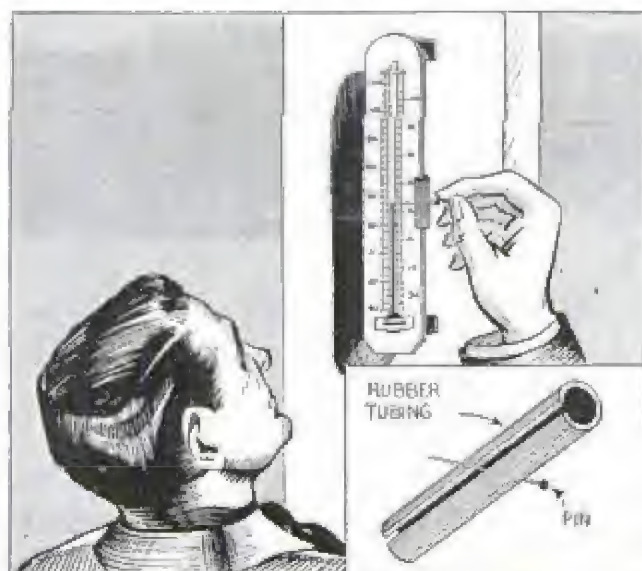
Tool Chest Has a Removable Carrying Box



Thermometer Readings Marked with Pin on Rubber Grip

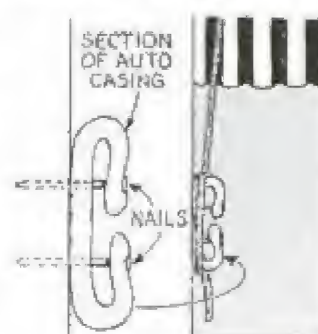
Instead of trying to remember previous temperature readings, one dairyman provided a simple thermometer marker. This is nothing more than a pin pushed through

the wall of a short piece of rubber tubing, which is split lengthwise so that it can be slipped over the edge of the thermometer. It's a simple matter to slide the whole tube up or down as may be necessary.

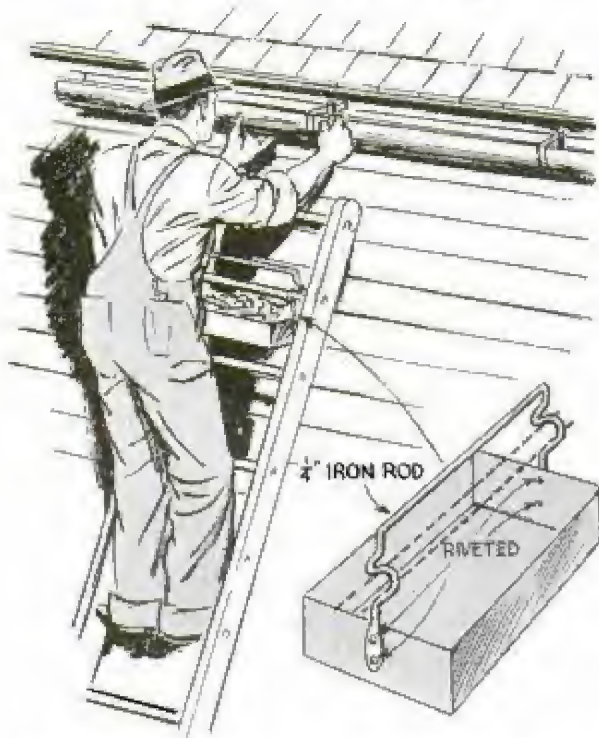


Rope Cleats from Old Tires

Improvised tieless cleats for use on boats or with awnings can be made from strips of old auto tires, which are nailed in place as indicated. The elasticity of the rubber will permit the rope to be wrapped around the cleat two or three times.



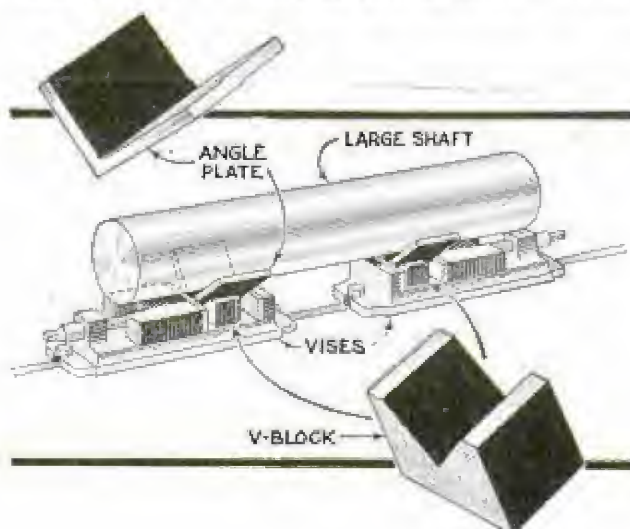
Toolbox Handle Bent to Hang from Ladder Rung



One tinsmith who had many jobs of putting up eave troughs and similar work, fitted his toolbox with an iron-rod handle, which he bent as indicated so that he could hang it on a ladder rung. The handle keeps the tools conveniently at hand and can be removed from the ladder by simply lifting it off.

Rigid Setup for Large Shafts

When a large shaft has to be laid in V-blocks and there is none at hand large enough to take it, you can use two small ones with the setup shown. Two vises of similar size and two angle plates are necessary. The V-blocks are first set in the



vises, after which the angle plates are set in them and tightened up. This lines up both plates accurately and a rigid setup is obtained.—H. Moore, Leeds, England.

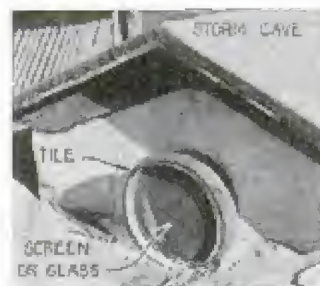
Shipping Clerk Suspends Crayon with Length of Elastic

To keep his marking crayon within easy reach, yet out of the way, a shipping clerk suspended it above his bench with a length of elastic and an ink-dropper bulb. One end of the elastic was tied into the bulb,

which was then slipped over the end of the crayon. The elastic permitted the crayon to be pulled down for marking.



Tile Forms Window in Storm Cave

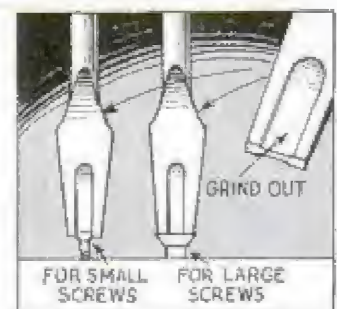


Light and ventilation are provided in this farm cave by using a short piece of 14-in. tile as a window. A glass disk fitted into the bell end of the tile and retained with a wood ring keeps out cold winds in winter, and a screen disk substituted for the glass affords ventilation in warmer weather.

Two Screwdrivers in One

Time can be saved on assembly jobs requiring two screwdrivers of different sizes by using the combination one shown. It is nothing more than a large screwdriver with

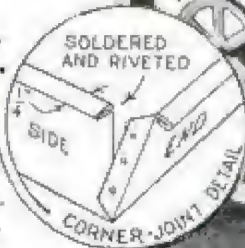
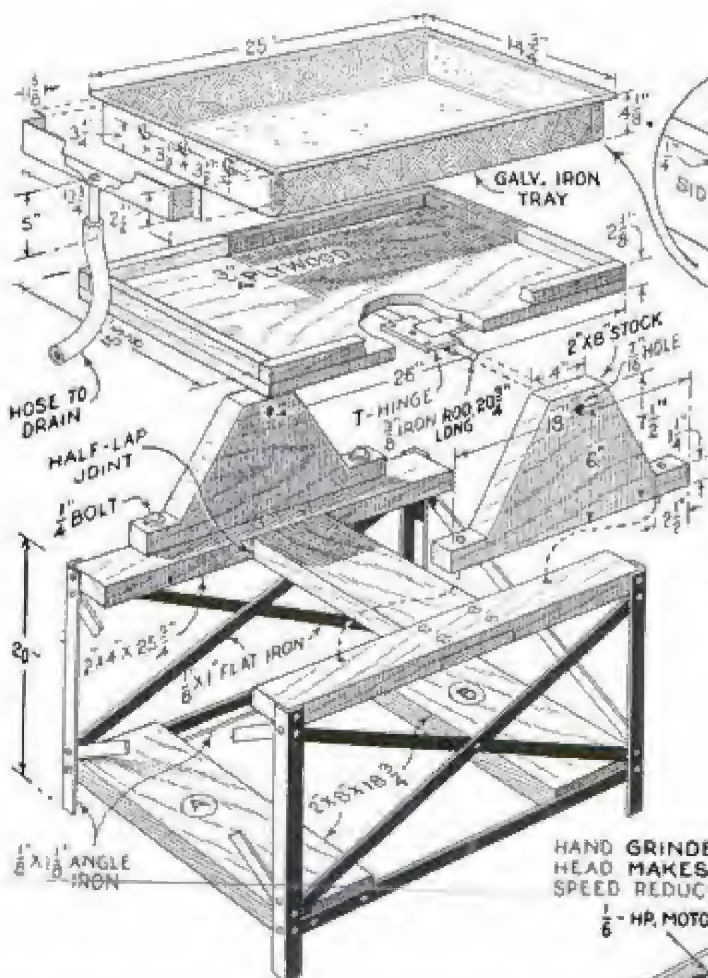
the blade ground down in the center to fit the heads of small screws. This does not interfere with using it for large screws.



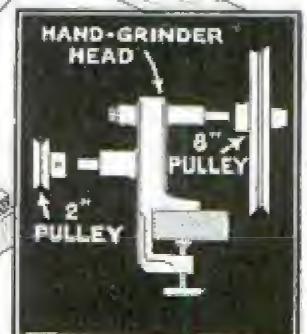
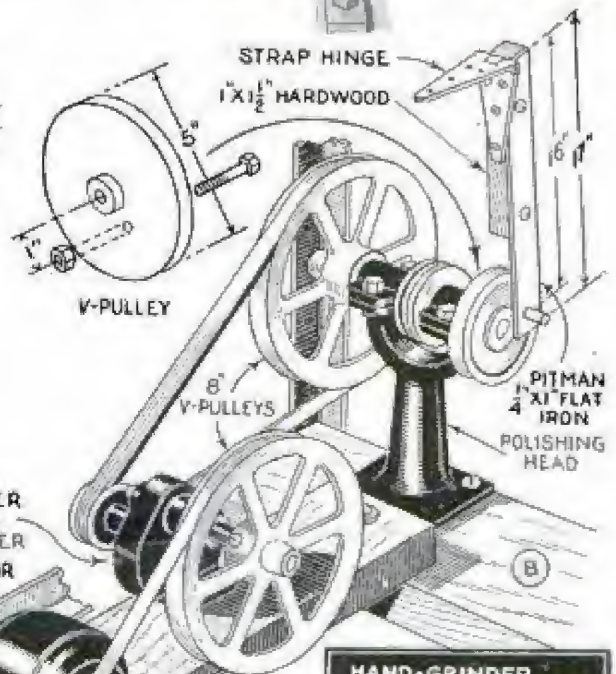
Rocking PRINT WASHER

Saves Time in the Darkroom

This washer gives just the right degree of agitation for thorough washing of prints and its action is fully automatic, requiring no attention during the washing process. Also, the gentle rocking motion prevents the prints from sticking together where a number are washed at the same time. The sheet-metal tray is fitted in a base which is pivoted at the center as you see in the detail below. The tray is fitted with an extension or "pocket" from which a small quantity of waste water drains away each time the tray rocks back and forth. A length of rubber tubing from the faucet supplies fresh water to replace that which drains away.

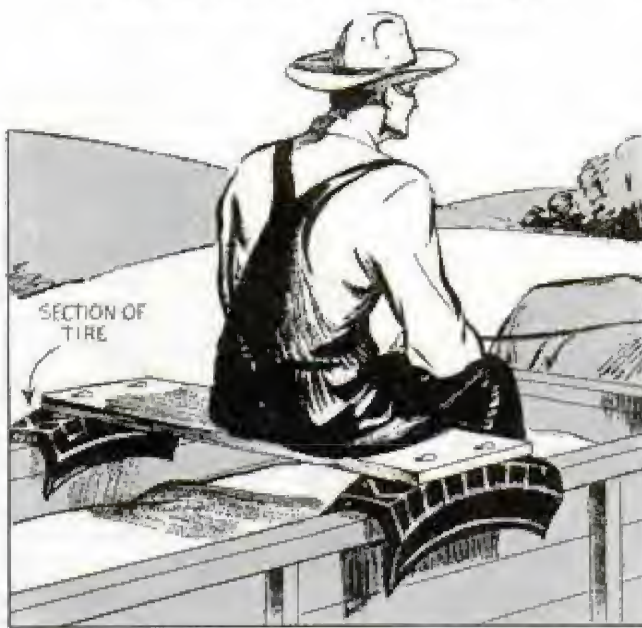


HAND GRINDER
HEAD MAKES
SPEED REDUCER
1/6 - HP. MOTOR



Materials used in the construction are easy to obtain anywhere. Although angle-iron legs and flat iron for the braces are used in the stand, these parts can be hardwood if desired. The reduction gear is made from an old hand-grinder head combined with a polishing head as shown in the detail at the right. The heavy cross-members, A and B in the detail above, support the reduction-drive assembly. Any small motor of 1,750 r.p.m. will operate the washer at the proper speed.

Improved Seat for Farm Wagon Has Auto-Tire "Springs"



A resilient seat for the farm wagon may be provided by bolting two sections of auto tire to the underside of a suitable board as shown. The tire sections straddle the sides of the wagon box to hold the seat in place and also give a cushioning effect.

Blueprint Held Flat on Table by Small Washers

Difficulty of keeping a blueprint spread on a bench or table may be eliminated by attaching a small metal washer at each corner with gummed-paper tape, as indicated.



Transporting Live Minnows



The conservation department of Wisconsin reduced the mortality of live minnows being transported to restock lakes and streams by allowing ice water to drip into the water cans while in transit. This was

done by using milk cans in which pieces of cloth were suspended to hold lumps of ice as indicated. Melting of the ice keeps the water in the can from becoming too warm, and also helps to increase the supply of oxygen in the water.

Correcting Mimeograph Stencils

It is unnecessary to cut a new mimeograph stencil by the usual method, because of an error in which the letters of a few words have been ruined beyond repair, if you use the following idea: With a sharp knife cut out the damaged part and trim the edges of the opening cleanly. Then make the correction on a fresh stencil and cut it out, making the piece slightly larger than the section removed



from the original. Fasten this in the proper place with regular correction fluid. If possible, the corrected strip should be placed on the side of the stencil next to the ink pad, as the ink will tend to loosen the patch if it is placed on the outside.

—Lawrence E. Petery, Vancouver, Wash.

Paper Holder from Door Catch Grips Firmly

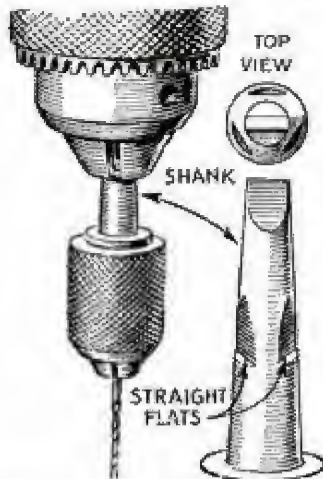
Screwed to a block, a screen-door catch of the type shown provides a good holder for labels, shipping tags, etc. The top roller of the catch allows papers to be re-



moved easily without tearing and also permits one paper to be removed without the whole pack moving forward.

—Harvey Paisley, Edmonton, Alta., Can.

Using Two Chucks in Drill Press at Same Time



Mechanics who use drill presses that have separate chucks for small and large drills, can save time in changing the chucks by altering the taper shank of the small one so that it can be clamped in the large one. This is done by filing

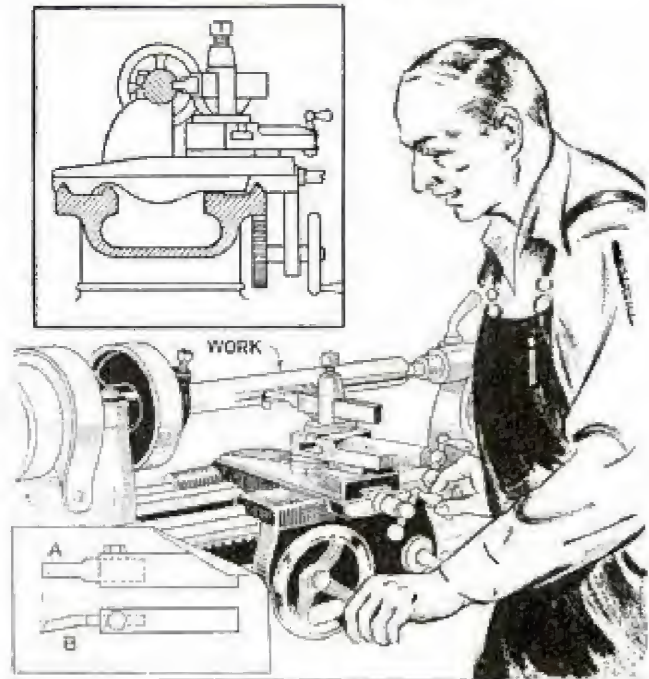
three equidistant flats on the shank, making them about $\frac{3}{4}$ in. long. The shank is not weakened appreciably, and the flats do not interfere with using the shank in the drill-press spindle when desired.

Auto Skid Chain Good Substitute for Weed Hook

Weeds and trash that are difficult to turn under with a plow can be covered if a skid chain is fastened to the front end of the beam and allowed to drag back in the furrow. The chain needs no attention as it follows the work automatically.



Cutting Keyways on Your Lathe in an Emergency



On a job where a keyway had to be cut in a shaft, and a shaper or milling machine was unavailable, I did the work on a lathe. The shaft was centered tightly so it would not turn, and a tool was ground to the shape shown at A and B, making the cutting edge the same width as that desired for the keyway. After mounting the tool, the carriage was run back and forth by hand, taking very light cuts until the keyway was the desired depth.

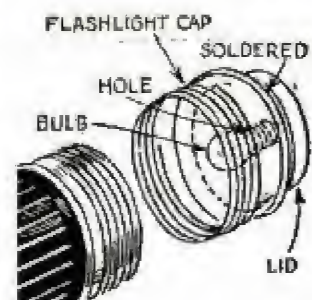
—Walter F. Purkis, St. James, Man., Can.

Carrying Spare Flashlight Bulb

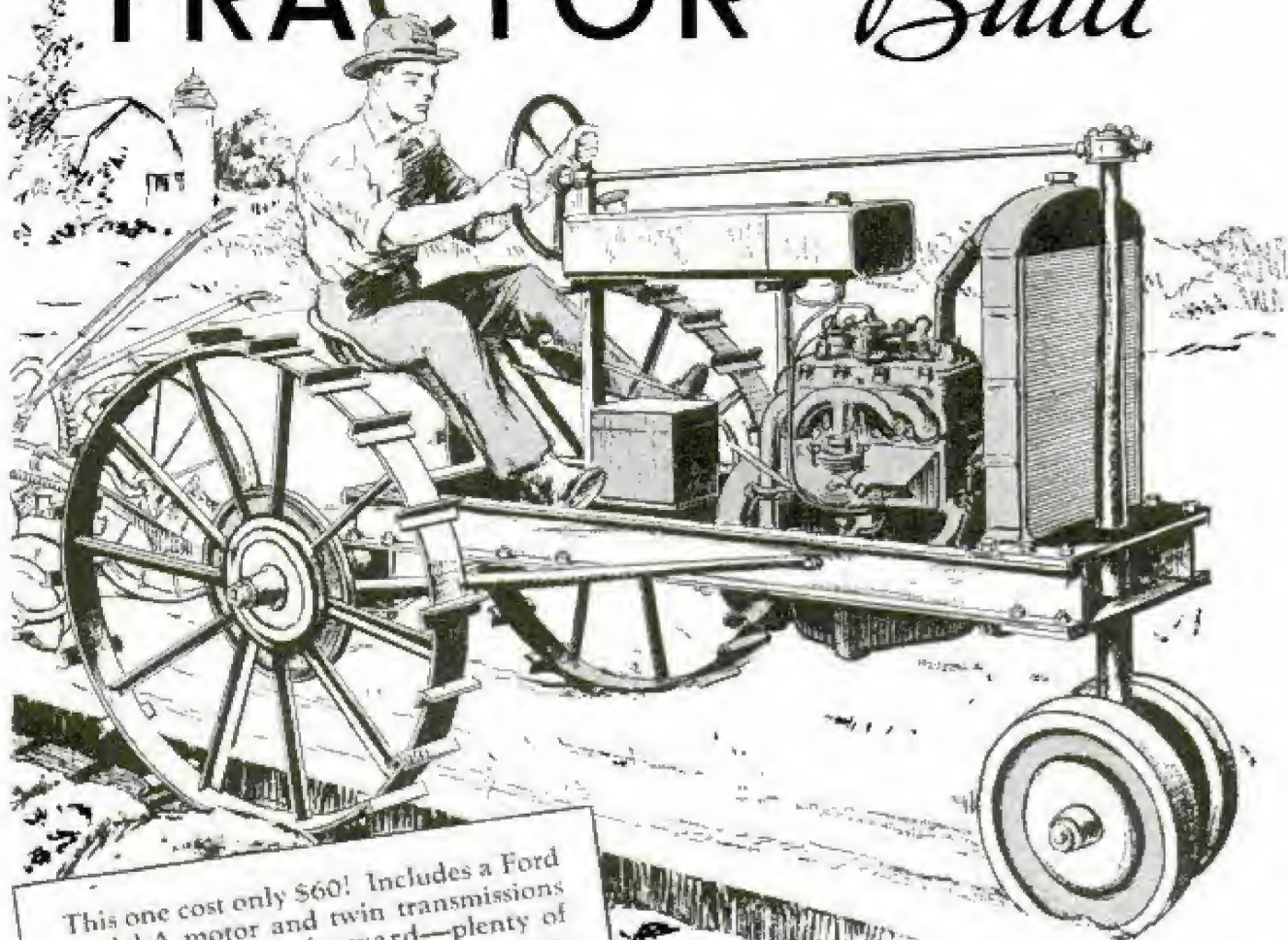
Workmen who use flashlights considerably and would like to carry a spare bulb, but do not have room in the bottom of the flashlight, can provide the necessary space by soldering a

small metal lid to the cap. Before doing this, drill a hole in the cap to take the base of the bulb, which extends into the lid. Another way of gaining the extra space is to solder the reflector of an old flashlight to the cap, making the hole in the latter large enough to screw the bulb into the threaded neck of the reflector.

—W. C. Wilhite, Carlinville, Ill.



TRACTOR *Built*



This one cost only \$60! Includes a Ford model-A motor and twin transmissions giving six speeds forward—plenty of power to pull a two-bottom plow, a two-row cultivator and other implements. Wrenches, hacksaw and drill are about the only tools needed—except some welding at your local machine shop

By H. SUDDABY

PART I

Frame, Motor, Steering Gear and Driving Mechanism

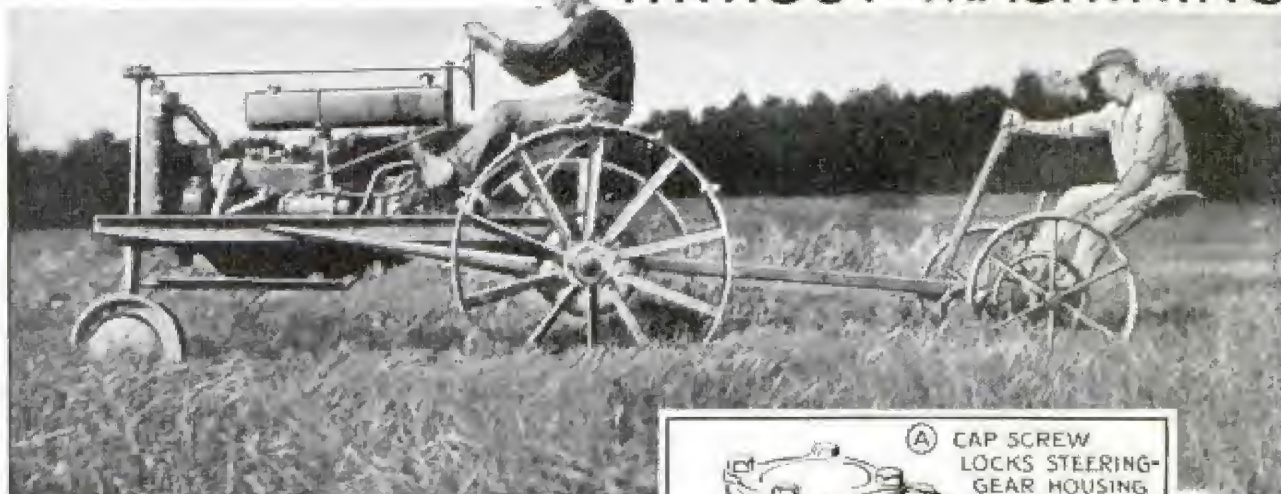
HERE is power and plenty of it for truck gardeners or owners of small farms who want a dependable tractor at low cost. Its high wheels and wide tread make this tractor ideal for modern row-crop tillage. Under average soil conditions, it will handle a two-bottom 12-in. plow, a 6 or 7-ft. tandem disk harrow, and with a little altering, some two-row cultivators can be adapted to use with it. In some cases, wheel weights will add considerably to the tractive effort under heavy pulls. Anyone can build the tractor as it consists of old

car and truck parts so ingeniously selected that the assembling can be done with wrenches, a hack saw and a little welding, the latter being done for a few dollars by your local machine shop.

Begin construction with the steering assembly, which is detailed in Figs. 1 to 5. For this you will need one Chevrolet steering column complete, one differential housing, two axles, two front spindles complete with wheels, and one model-T Ford truck drive-shaft housing. First cut off one end of the differential housing at the spring saddle 4 in. from the brake assembly. Remove the rivets that hold the brake flange. Next cut off the end of the drive-shaft housing 4½ in. from the universal casting, removing enough from the other end of the housing to make it 37½ in. long. Now weld the short piece of differential housing to the drive-shaft housing as in Fig. 3. Notice that the rear-axle bearing is used to

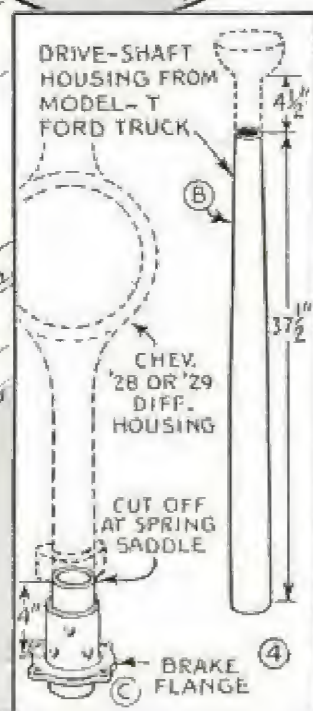
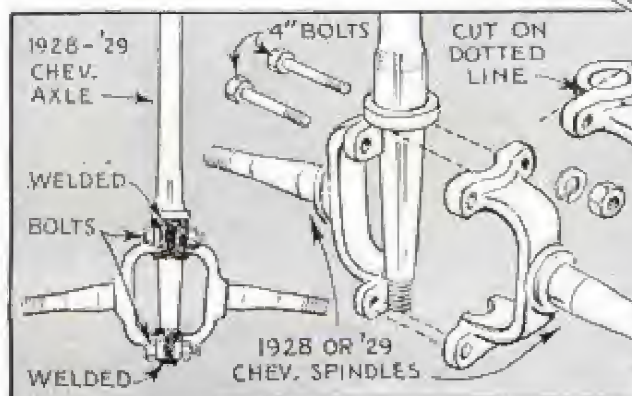
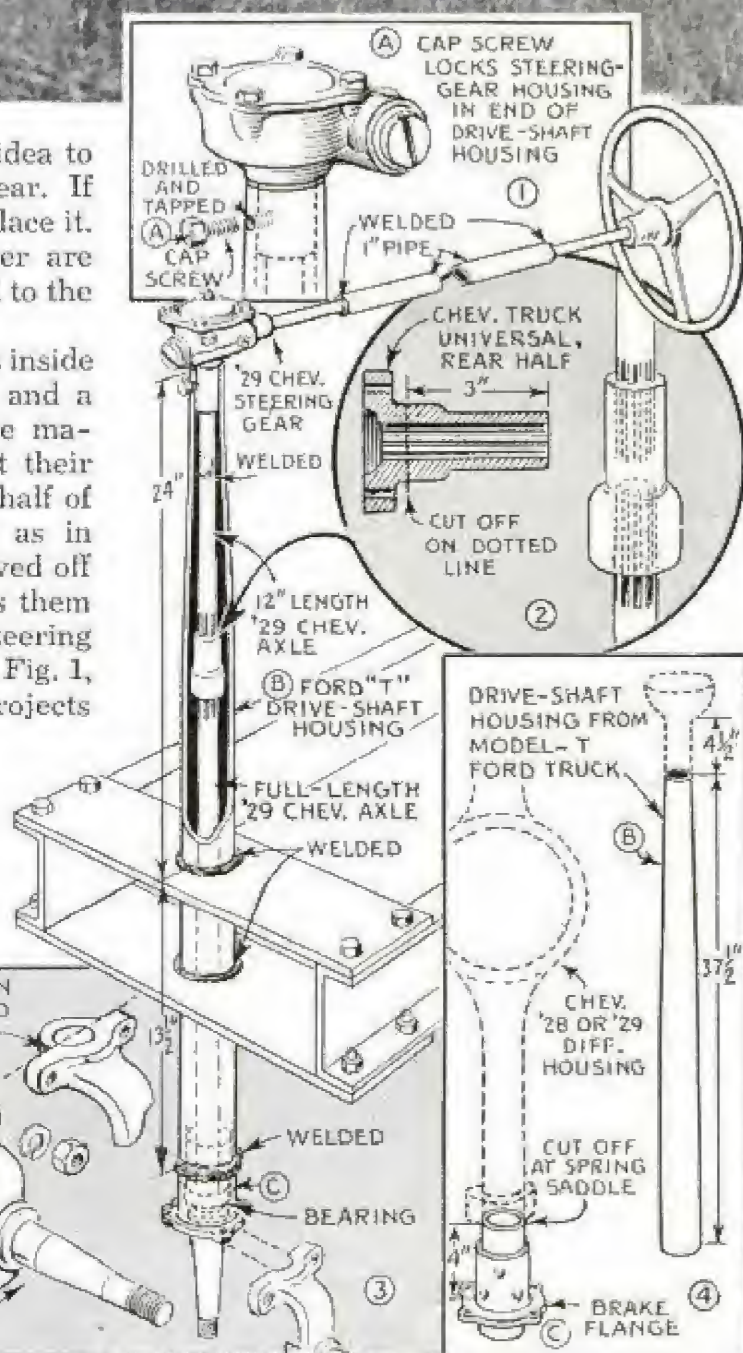
from Old Car Parts

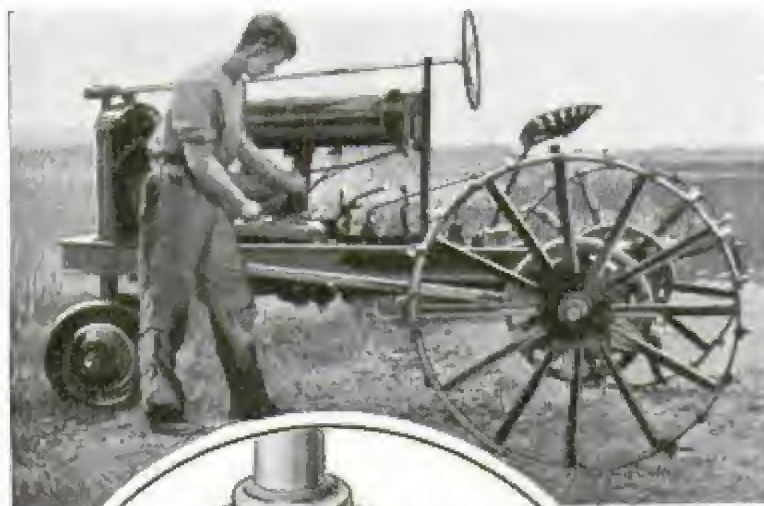
WITHOUT MACHINING



support the front end. It is a good idea to examine this bearing closely for wear. If undue wear shows, it will pay to replace it. The dust plate and grease container are cut in half so that they can be bolted to the axle after it has been inserted.

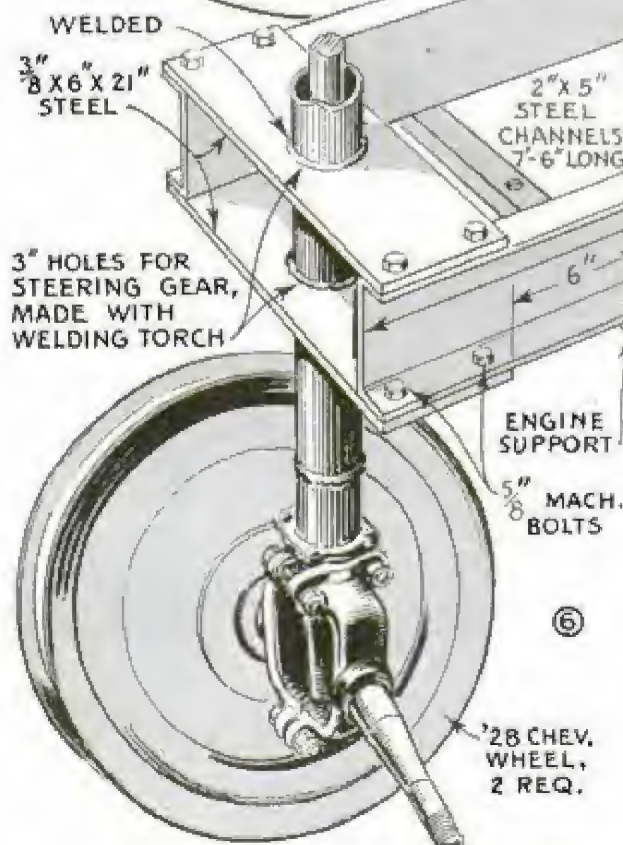
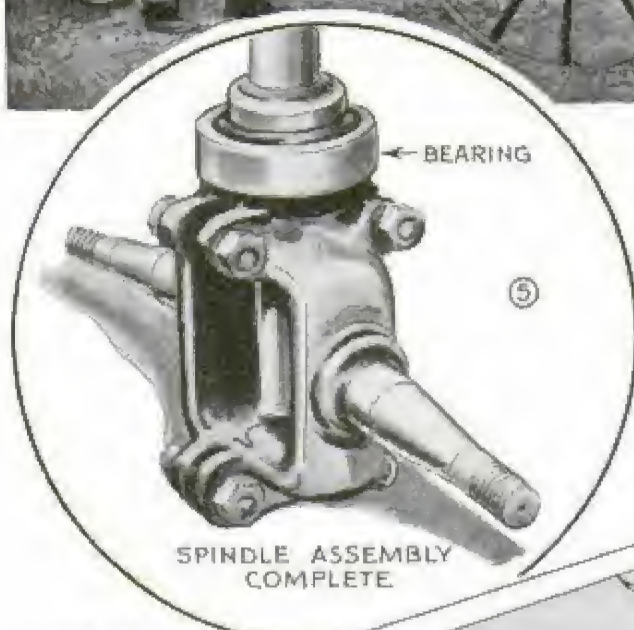
Then assemble the Chevrolet axles inside the housing, using one full length and a 12-in. length of the other. To save machining the shafts, you can connect their splined ends together with the rear half of a Chevrolet truck universal joint as in Fig. 2. The shoulder or flange is sawed off to leave a splined sleeve, which ties them together without play. Mount the steering column on top of the assembly as in Fig. 1, and weld the end of the shaft that projects from the gear housing to the axle end. You will have to drill and tap the upper end of the drive-shaft housing for a cap screw to keep the column in position. The steering-wheel shaft will have to





be cut in the center and a 4-ft. length of $\frac{3}{4}$ -in. pipe slipped over the ends and welded to lengthen the shaft so that it will reach back to the operator's seat. Next comes the wheel spindles, which are bolted and welded to the tapered lower end of the steering assembly after cutting the bosses off the spindles as shown in Fig. 3. Care must be taken with this assembly to make sure that both spindles are tilted to the same angle as indicated. In the vertical plane the spindles should aline exactly, otherwise, the front wheels would toe in or out, making the tractor difficult to steer.

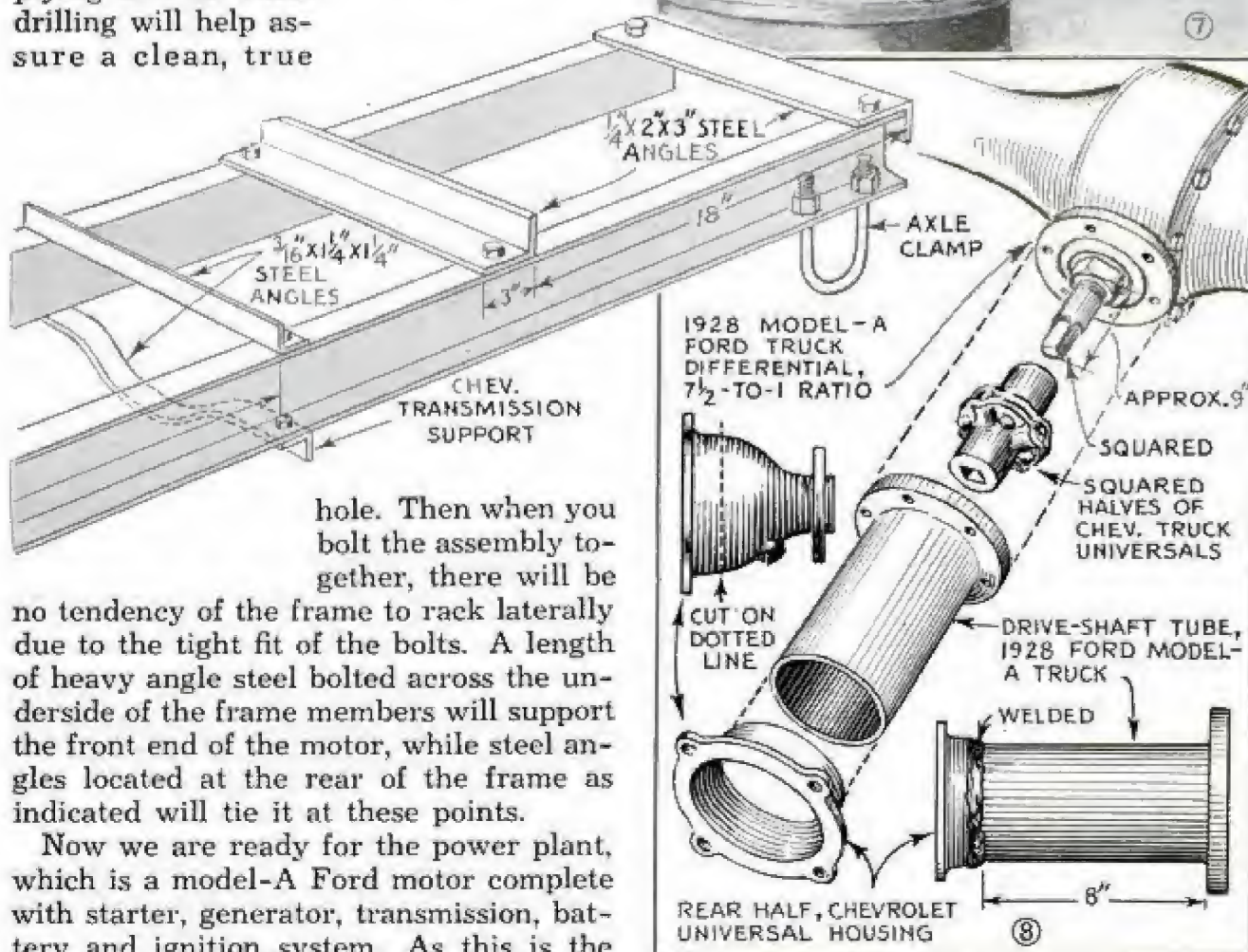
Now you are ready for the frame. The side members are made from channel steel as in Fig. 6. They are drilled as indicated $37\frac{1}{2}$ in. from the front



FASTENING SPINDLE ASSEMBLIES TO TAPERED END OF AXLE SHAFT TILTS WHEELS AT JUST THE RIGHT ANGLE FOR EASY STEERING

end to permit them to be bolted to the motor. However, it is a good plan not to drill these holes until the frame is assembled with the two front members and the rear member bolted in place as described later on. It will help greatly when you get the frame assembled to support it at a convenient working height. Then when you have the rear transmission and rear end ready, these parts can be bolted and blocked temporarily in place and the motor set in position for alining as you see it in Fig. 9. To make the assembly line up properly it may be necessary to shift the motor slightly. This would mean that if holes were already drilled you might have some difficulty relocating them in the required position. The two cross members that support the front-end assembly have 3-in. holes drilled or burned in the center

with a welding torch to allow the steering column to be inserted and welded as shown in Fig. 3. These members must be welded 5 in. apart to allow them to be slipped over the ends of the frame members and fastened with $\frac{5}{8}$ -in. bolts, the top front member being located 24 in. from the top of the drive shaft. As the front of the frame is subjected to rather severe twisting strains, it is best to drill the holes with a $\frac{5}{8}$ -in. drill bit, using each cross member as a jig so that the holes register perfectly. Applying lard oil while drilling will help assure a clean, true



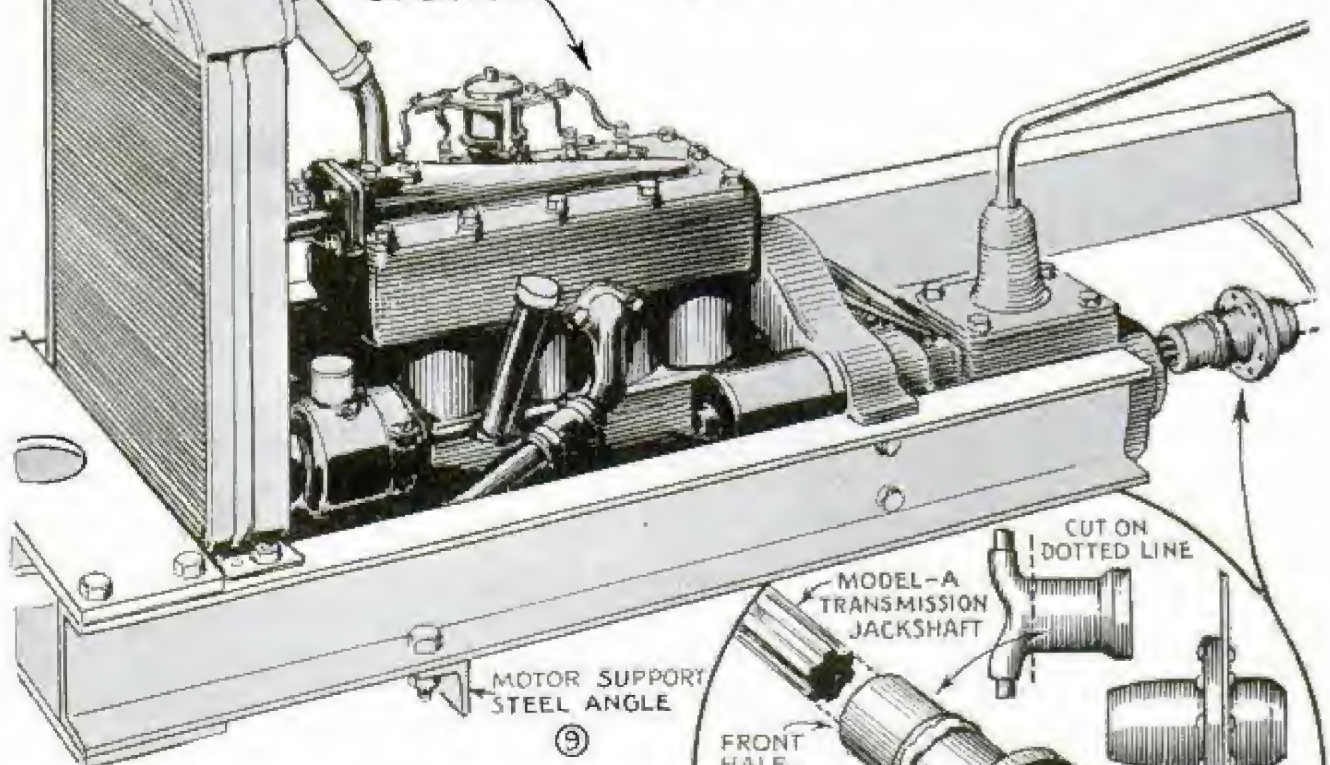
hole. Then when you bolt the assembly together, there will be no tendency of the frame to rack laterally due to the tight fit of the bolts. A length of heavy angle steel bolted across the underside of the frame members will support the front end of the motor, while steel angles located at the rear of the frame as indicated will tie it at these points.

Now we are ready for the power plant, which is a model-A Ford motor complete with starter, generator, transmission, battery and ignition system. As this is the heart of the tractor, it must be in good condition. If the motor has seen considerable service, it should be reconditioned completely and any worn parts replaced. The same goes for the transmission. Remove the cover, wash out all old grease with gasoline and inspect the gears and bearings for excessive wear. If some are worn badly, replacement at this time may avoid breakdowns later. Assemble the transmission and fill it with fresh lubricant. Now mount the motor assembly temporarily in position in the frame. Then get a four-speed Chevrolet truck transmission and a model-A Ford truck differential

assembly to complete the driving mechanism. Clean them thoroughly and inspect for wear, replacing any parts that seem to be worn badly. If this is not done, additional wear will be rapid due to continuous strain on these parts when the tractor is pulling a load. To connect the transmission and differential, carefully square the stub shaft of the latter with a file to take the square opening of a connector made by bolting the rear halves of two Chevrolet-truck universal joints together as in Fig. 8. Then cut off the model-A Ford drive-shaft tube that came with the



FORD' MODEL - A
MOTOR COMPLETE
WITH TRANSMISSION,
STARTER AND
GENERATOR



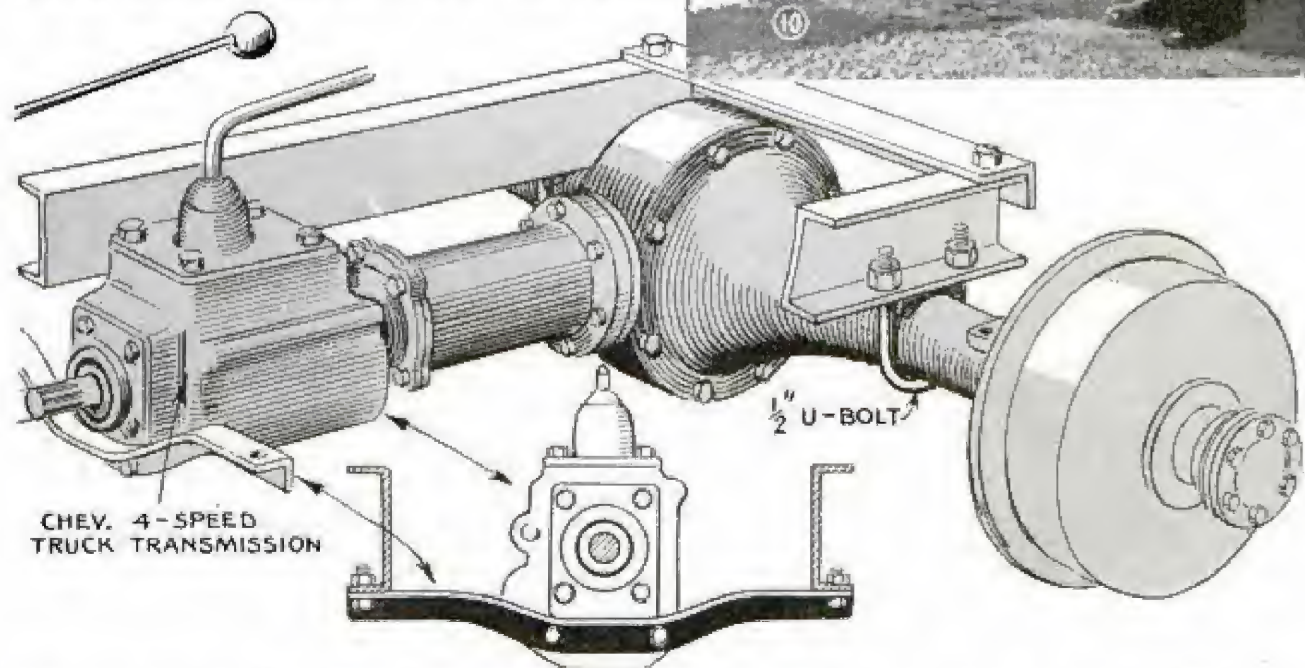
truck differential 8 in. from the flange at the rear end and weld the rear half of a Chevrolet universal-joint housing to the severed end as in Fig. 7, first cutting off the rear end of the universal housing as indicated in Fig. 8. This allows you to bolt the transmission and differential rigidly together as shown in Figs. 9 and 10. Now set this assembly temporarily under the

rear end of the frame. A connector to fasten the stub shafts of the two transmissions together and complete the driving mechanism is shown in the circular detail of Fig. 9. This consists of a Chevrolet clutch hub, with the clutch disk removed, welded to the front half of a model-A Ford universal joint, which has been sawed off as indicated by the dotted lines. This gives you a strong connector that will slip over the splined ends of the two transmission shafts of different diameters without expensive machining in having a sleeve made for this purpose.

Now you are ready to aline the motor, transmissions and differential and bolt them in their respective positions in the frame. This must be done perfectly, otherwise the bearings will wear rapidly. The motor has to be tilted down in the rear so that the transmissions and drive shaft are in a straight line with one another. After all shafts have been lined up, an angle steel support should be bent and bolted in place on the front end of the Chevrolet

transmission, holding it rigidly to the frame. Several short bolts must be screwed into the holes in the front end of this transmission, that formerly held the clutch housing to the transmission, to prevent the gear oil from leaking out. However, two of the bolts are used to hold the support previously mentioned. Next, the front motor support may have to be bent up or down to aline the transmissions with one another. If the two are in alinement, the jack shaft at the rear end of the Chevrolet transmission can be turned freely with the hand if both transmissions are in neutral.

After this work has been done, bolt the rear end assembly to the Chevrolet transmission and fasten the axle housing rigidly to the frame with heavy U-bolts. Be sure, before you draw up the bolts between the transmission and rear end, that meeting surfaces are entirely free from hardened grease or accumulations of dirt. Use lock-



washers under all nuts and cap screws and draw them up evenly to avoid stripping threads. See that the driving assembly is not thrown out of alinement in doing this. It is a good idea to tack-weld the U-bolts

to the axle housing after perfect alinement has been assured. You are now ready for the wheels, seat, drawbar, etc., which will be given next month.

(To be continued)

Avoiding Leaks in Sewer Before Joint Cement Hardens

When sealing joints of a sewer pipe which must be used before the cement can set, you will have no trouble from leaks caused by water thinning it if you try the following method: Fill the joints with cement that has been mixed to a stiff consistency. Then at intervals of one half hour

or so, sprinkle a little dry cement over the joint. As the water seeps through, it will be absorbed by the dry material, which will harden and stop the leak. In some cases, two or three applications of dry cement may be necessary.

—J. E. Polisso, Rochester, Pa.

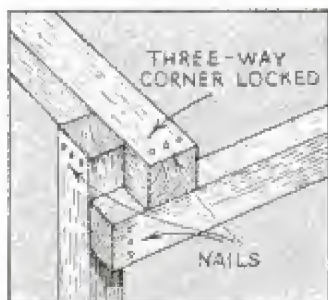
Loose Hay Holds Bales Safely When Piled for Storage



Baled hay is difficult to keep piled so that it will not slip or roll with danger to the workman who handles it. To avoid this, one dealer uses loose hay or straw which is scattered over each layer or row of bales to bind them together.

Three-Way Corner for Crates

Shipping crates nailed by this method cannot pull apart no matter which way the strain comes. When nailing the first two pieces at the corner, one is allowed to extend beyond the other the thickness of the stock. The third piece will then lie naturally in place.



Shovel as Temporary Signpost



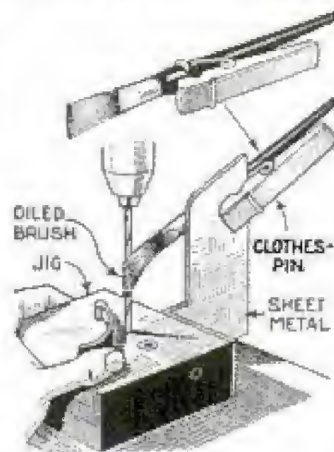
There are many instances when a sign must be posted hurriedly, on account of temporarily closing of roads, etc. A regular shovel will serve as an excel-

lent signpost for such emergencies, the shovel being forced handle first into the earth and the sign then attached by means of a string, looping it over the back as shown.—Opie Read, Jr., Chicago.

Small Drills Kept Lubricated with Fixed Brush

When using tiny drills in production work, it was found that a small brush dipped in oil saved time in lubricating them. The brush handle was fastened to a spring-type clothespin so that it could be clipped to a sheet-metal holder which was fastened to the drill block. To lubricate the drill, it was raised and the block slid slightly to touch the brush against the drill. One dip of the brush in the oil was found to be sufficient for several minutes use.

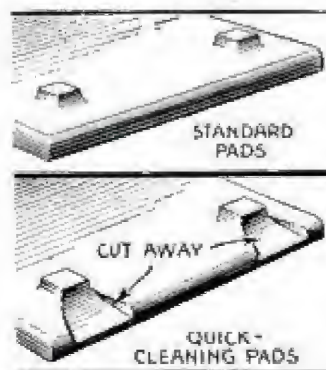
—W. F. Cowgill, Dayton, Ohio.



Drill-Press Locating Pads Are Cleaned Quickly

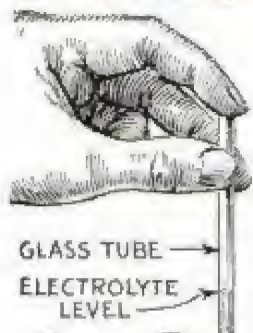
Time wasted in cleaning dirt and chips from a drill press or milling-machine jig, when standard locating pads are used, is saved by altering the pads as shown. One wipe with a small sash brush will clean off the pad because the dirt and chips slide down the sloping slots instead of lodging on the base of the jig.

—George B. Harran, Westfield, Mass.

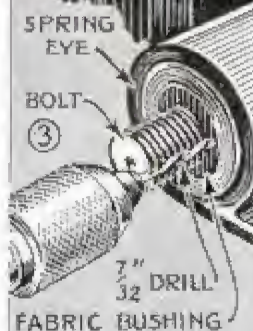
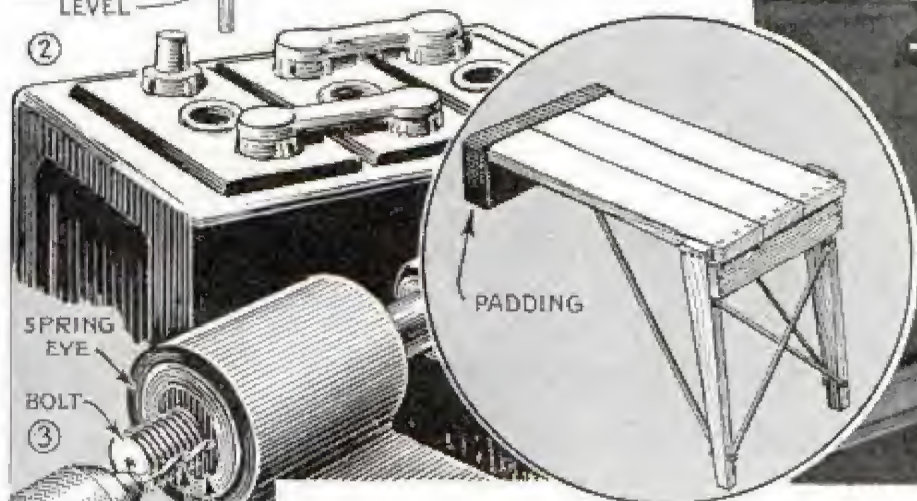
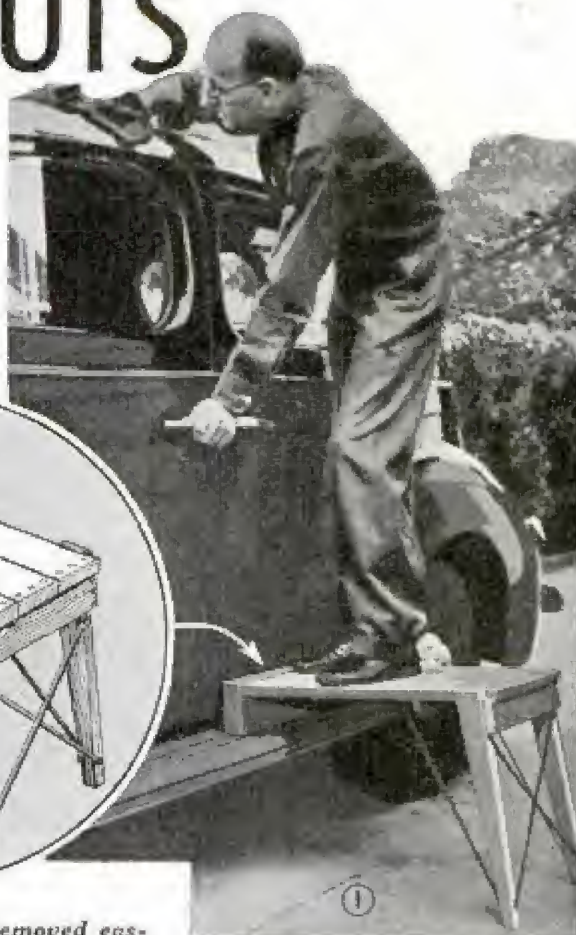


❑ Photographic developing solutions keep better in brown-glass bottles, and if the latter are unavailable, coat the outside of clear bottles with asphalt varnish.

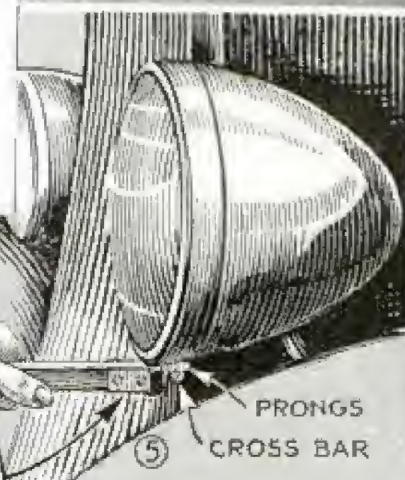
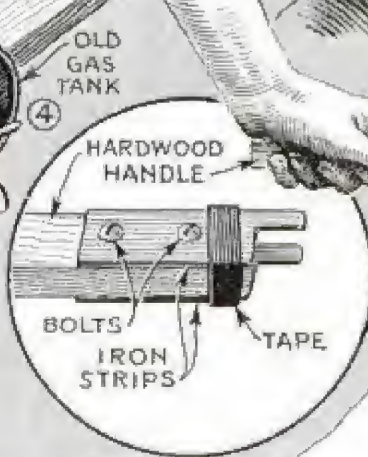
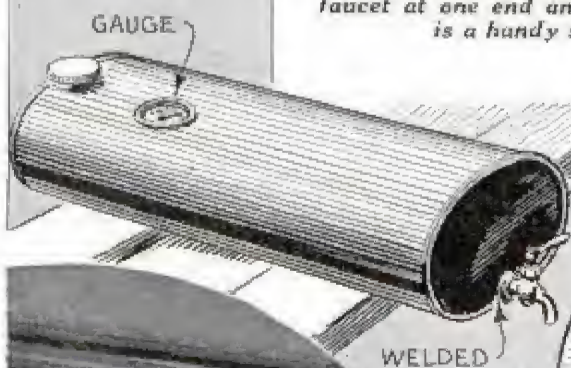
Auto SHORTCUTS



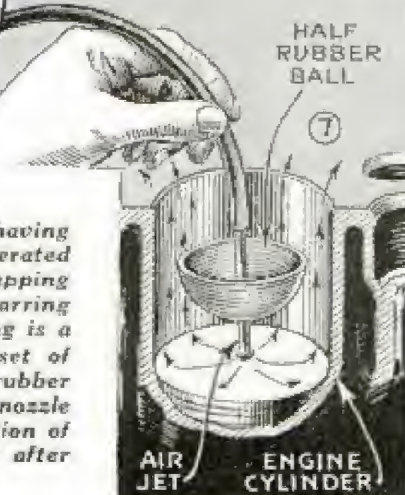
When cleaning your car, the bench in 1 solves the problem of reaching the top. The legless end rests on the running board. Battery electrolyte level is determined quickly by inserting a glass tube to touch the plates, then closing the upper end with a finger, and removing the tube as in 2



A fabric-type shackle bushing is removed easily if a small drill is run between the bolt and the outer casing as in 3, so that the bushing can be compressed slightly. If you purchase motor oil in bulk, an old gas tank fitted with a faucet at one end and a gauge on top as in 4, is a handy storage container



Headlamp latches of the type having spring-loaded cross bars are operated easily with the tool in 5. A wrapping of tape on the tool prevents marring the lamp. Your stoplight housing is a handy place to carry a spare set of keys as in 6. Half of a hollow rubber ball slipped over the air-hose nozzle as in 7 causes a better distribution of air when blowing out cylinders after a motor-cleaning job

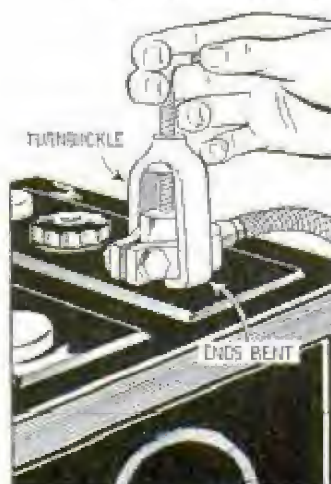


Stud Bolts Removed with Tool Improvised from Nut



When you have a stud bolt to remove and there is no special stud wrench at hand, you can use an end wrench and a nut altered as shown. Just file a notch in the threaded hole of the nut, sloping one side. Then slip it over the stud with the sloped side facing opposite the way the stud is to be turned. Drop a short piece of small rod into the slot and turn the nut with a wrench. The rod will roll up the sloping side of the notch and bind tightly against the stud so that it can be turned.

Storage-Battery Terminals Pulled with Altered Turnbuckle

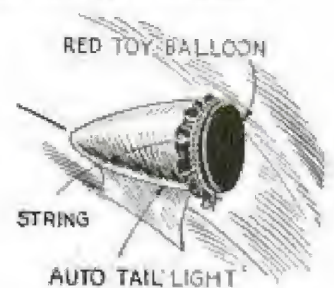


Instead of loosening a battery terminal with a hammer or pry bar, take a few minutes and make up this tool, which will do the job easily without danger of damaging the post or pulling the plates loose. Saw off one end of a

turnbuckle and bend in the resulting legs at right angles to straddle the post and slip underneath the terminal. Then bend the end of the remaining turnbuckle screw at right angles to form a handle and the tool is ready for use.

Emergency Taillight Lens

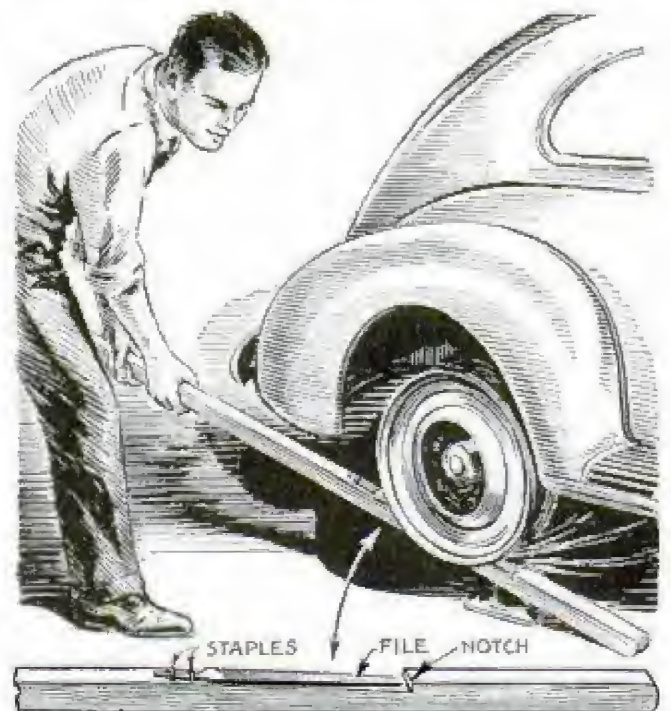
When the glass in the rear lamp of a car is broken, and a new one is not available, a temporary substitute can be provided with a section of a red-rubber toy balloon. This should be stretched over the rim of the lamp and held in place with a piece of string or rubber band.



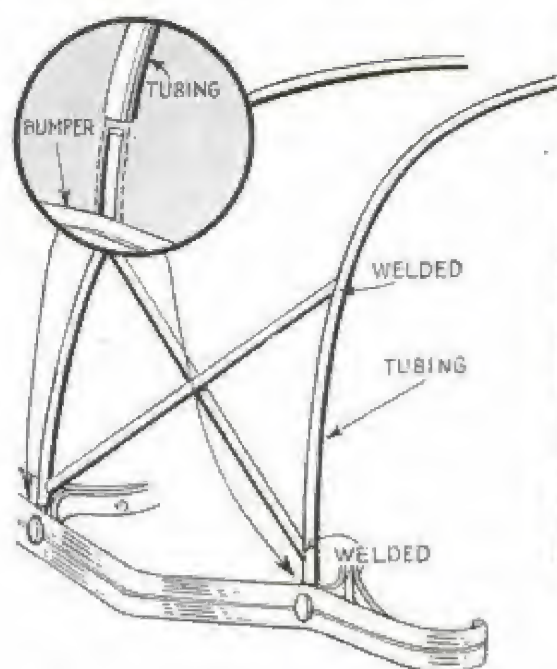
—Ivan J. Stretten, Detroit, Mich.

Wooden Arm Holds File Safely to Clean Wheel Rim

After a workman had been injured slightly while cleaning rust from the rim of a rotating wheel, a mechanic constructed this simple holder for the file. A stout oak stick was notched and provided with staples to hold the file in place while the wheel was driven in reverse. It was possible to apply the pressure easily, and the cleaning was accomplished in less time.



Slip-On Canoe Rack Fits Pins on Bumpers



Highly convenient in that it can be instantly removed from the car because it merely slips on four pins attached to the bumpers, this canoe rack is a compact and rigid unit which holds the canoe well up over the top of the car and does not interfere with the opening of doors or with driving. Steel tubing, $\frac{1}{2}$ in. inside diam-

eter, is used to make the rack. Flat-iron crosspieces welded to the ends provide the necessary rigidity. The pins on which the tubing fits, are lengths of $\frac{1}{2}$ -in. steel rod, projecting about 8 in. above the bumpers as shown in the circular detail. The rods are bolted to the bumper brackets, which may be accomplished by flattening part of each rod and drilling the flattened part to take the bumper bolt.

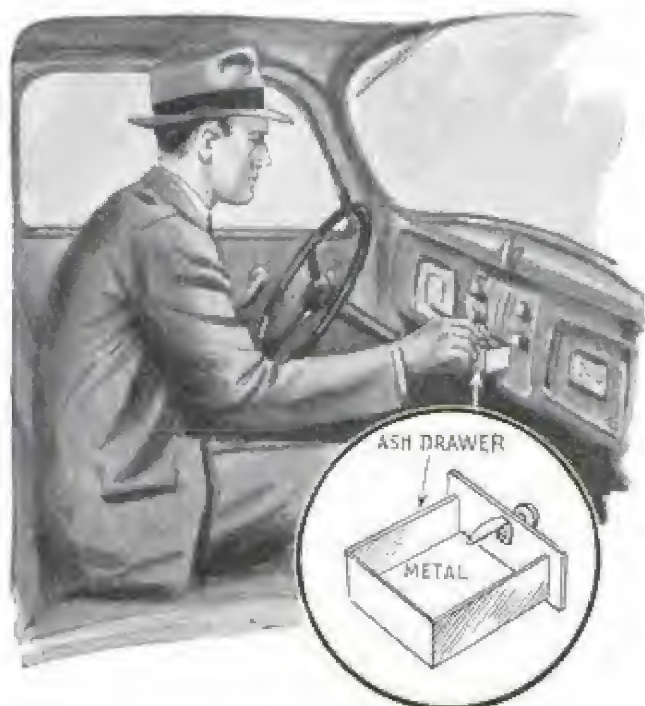
—Robert D. Forster, Montreal, Que., Can.

Driver Scrapes Out Pipe in Ash Drawer with One Hand

I have found that a strip of metal fastened inside the ash drawer of my car enables me to scrape out ashes from a pipe

with one hand conveniently. This method eliminates fire hazard involved in knocking hot ashes out of an open window as they are frequently blown back into the upholstery of the rear seat. The metal strip is tapered at one end to fit the pipe bowl and is drilled and bent at the other end to fit under the drawer-pull screw.

—J. Modroch, Danbury, Conn.

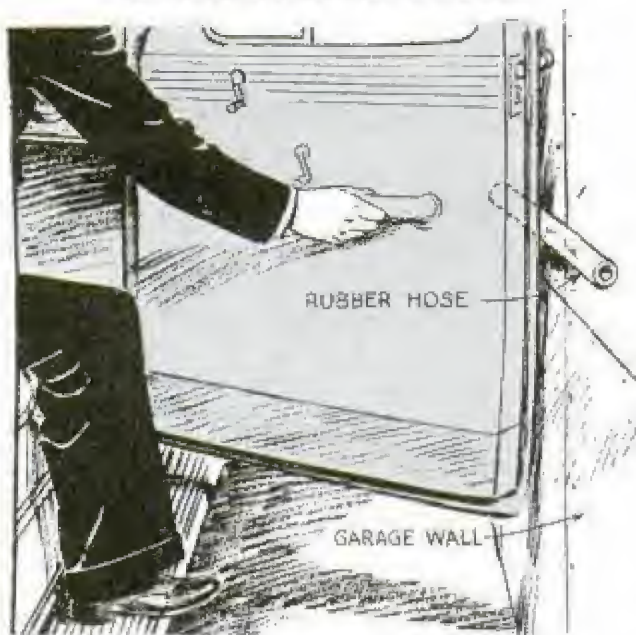


Locating Break in Drive Assembly

One mechanic uses the following method to locate trouble in the driving mechanism of a car. First he jacks up one rear wheel and, with the car in "high," moves the ring gear with a screw driver inserted through the grease hole in the differential. If the gear moves freely, the break is in the drive-shaft assembly. If the gear does not move the break is between the gear and rear wheels, probably an axle shaft or key.

—C. E. Packer, Chicago.

Rubber Bumper on Garage Wall Protects Door Finish



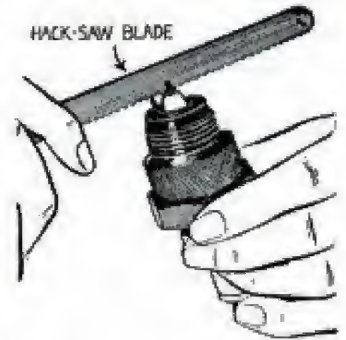
If your garage is narrow so that the door sometimes strikes the wall when opened, fasten a length of garden hose at this point. The hose will absorb the jar and prevent the paint from being nicked off the door. In cases where the door handle strikes a plaster or soft-board wall, and is apt to

puncture it, the same method of providing a bumper can be used.

—Harry W. Boedecker, Pittsburgh, Pa.

Gap in Spark Plugs Adjusted with Hack-Saw Blade

Automotive engineers have found that flat surfaces in spark plugs last longer in service than curved ones, with the result that the gap between the electrodes or "points"



is often made with a milling cutter or circular saw. When readjusting the gaps after the plugs have been used, practically the same setting as the original can be obtained by using a hack-saw blade. This is ground to the right thickness, usually .025 in., after which the electrodes are closed together so that the blade cannot be slipped between them, and the gap is sawed to the correct setting.

"Skipper"—Low-Cost, 14-ft. Outboard Runabout



At an expenditure of only \$30 to \$40 you can build this trim, five-passenger runabout, which is powered by a 4 to 24-hp. outboard motor. Its speed ranges from 9 to 24 m.p.h. depending on the size motor used. The boat has a 54-in. beam, 15½-in. freeboard, 24-in. depth, a 5-in. draft at 725 lbs., and a weight of about 275 lbs. Six plans (Nos. 1018 to 1023 incl.) showing details of building besides sheets giving material list and outline of procedure will be sent postpaid on receipt of \$1.

400 Build-It-Yourself Plans

Every home workshop owner should have our illustrated catalogue for constant reference to get ideas on what to build. Shows nearly all projects as they look when finished. Includes modern and colonial furniture, home and garden improvements, workbenches, tool cabinets, motor-driven machines, models of all kinds, outdoor-sport devices, radio equipment, electrical devices, toys and novelties, juvenile articles, etc. The only cost to get this new catalogue is a three-cent stamp. Be sure to print your name and address carefully when ordering.

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- "Roamer"—765 to 770: Outboard cabin cruiser; two berths. Six prints \$1.00.
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- 12-Ft. Utility Rowboat—707: Flat bottom. Four seats. Sturdy design. 25c.
- 16-Ft. Canoe—811 and 812: Cedar planking covered with canvas. Two prints 50c.
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Champion Spark Plugs

—the overwhelming choice of
“Doodlebug” Champions!



Bunched like hounds on a scent, wheel to wheel and fighting every inch of the way, a pack of midget race cars or “doodlebugs” roars and slides ‘round a small race track. In this, one of the fastest-growing sports in the nation, midget race car drivers must have split second response to accelerator. They know their spark plugs must with-

stand fouling, and pre-ignition due largely to leakage—common to ordinary spark plugs—and eliminated by Champion’s patented Sillment seal. Records show practically every “doodlebug” champion, national and sectional, as well as the majority of all racing drivers, insists on dependable Champion Spark Plugs. Use the spark plugs champions use and you will insure all ‘round better engine performance in your car.

IT'S THRIFTY TO INSTALL NEW SPARK PLUGS — Demand CHAMPIONS

Test-Flying the Sky Giants

(Continued from page 715)

Allen does not fit the popular version of the test pilot who climbs aboard and shouts to the mechanics to pull out the wheel blocks so he can swoop aloft. He spends days, and sometimes weeks, on the ground



Pilot Allen lifting the Boeing clipper onto its planing step for a takeoff

with the plane before taking it aloft. Engines must be tuned to perfection. Controls must be adjusted to a fine degree. In the case of the XB-15 bomber, Allen taxied it back and forth on Boeing Field at Seattle for days after most preliminary work had been done. He was not to be hurried. Day after day he wheeled the huge bomber the length of the field, sometimes getting up speed enough to lift the tail wheel into the air, only to taxi back to the hangar for further adjustments. Finally, when he did take the bomber aloft, he knew everything was right. And it was. The immense plane lifted with the ease of the smallest plane. And the first landing was as gentle as if he had flown it for years.

His great amount of practical experience and technical knowledge takes a certain amount of risk out of test hopping. He can size a plane up and know whether to take it aloft or walk away from it. This latter alternative doesn't happen often. Allen merely points out to the manufacturer that such and such should be changed.

Allen always wears a parachute and he insists that any assistants (these huge modern planes require four and five men on test hops) wear parachutes.

A fine code of ethics must be observed by the free-lance test flyer. A pilot like Allen, testing for a half dozen builders, necessarily must have the confidence of each. He has detailed information as to the innovations planned by each manufacturer in the highly competitive military and

commercial fields. This information, Allen finds, must be stored in individual compartments, so to speak, in his mind so that he doesn't accidentally reveal to the Boeing company a secret new tail assembly which Sikorsky engineers have perfected, or vice versa.

Once the War Department had called for bids for a new type of plane and two of Allen's employers were competing. Each asked Allen to demonstrate his plane. The test pilot was in a quandary. But not for long. The solution was simple. He would test both planes. The manufacturers were agreeable. Allen, when the tests got underway, demonstrated both planes to the utmost of his ability and to the planes' abilities, being extremely careful not to



Miniature of the Stratoliner being tested in University of Washington wind tunnel

voluntarily or involuntarily give one or the other an unearned advantage.

Allen predicts with confidence that the day is near at hand when the mechanical hands will replace the human hands in flying even more than they have today.

Seedless Watermelons Grown in Greenhouse Patch

Watermelons without seeds, long sought by scientists, have been grown at Michigan state college by a Chinese graduate student, Cheong-Yin Wong. The exterior shape has been changed somewhat, being more pear-like than oval, but the taste is about the same. The new melon has smaller whitish, veiny sections than the normal melon, and Mr. Wong said that field production might be difficult but it has decided advantages for growing in greenhouses.

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I ever rolled*
..give me **VELVET**
every time



*Better
smoking
tobacco*

*Velvet packs easy in a pipe
Rolls smooth in a cigarette
Better tobacco
for both*

- the MILDNESS
of fine old
Kentucky Burley
aged in wood*
- the FLAVOR
of pure maple
sugar for extra
good taste*

New Cars for the Kings of Speed

(Continued from page 692)

sion in the rear. In torsion suspension the usual spring action is obtained through the twisting of long bars of special alloy. Since there is no universal joint on the drive shaft, the two rear axles have two universal joints each. Shock absorbers are of a combination hydraulic and friction type. Rear tires are eighteen by seven and one-half inches and the front tires are half an inch narrower. Engine exhaust stacks, instead of being carried out on the side of the car, are smoothed into the streamlining along the lower part of the frame. The in-

has a displacement of 240 cubic inches and develops about 200 horsepower. All of these engines are nonsupercharged and each of them has a compression ratio of thirteen to one.

Joe Thorne, Rex Mays, and Jimmie Snyder will comprise a team driving powerful cars designed by the Thorne Engineering company of Los Angeles. The cars are a year old, having competed first in the 1938 event, and are being changed to deliver more speed. Art Sparks, chief engineer for Thorne, is "souping up" two of the engines from an original 310 horsepower each to about 350 horsepower.

Two of the Thorne cars have supercharged motors of 179 cubic inches displacement each, burning alcohol fuel, and turning up to 7,000 revolutions per minute. The third motor is nonsupercharged and develops peak power at 5,500 revolutions. This motor has a three and seventeen-thirty-seconds-inch bore and a four and three-eighths-inch stroke. All of the Thorne cars have cross springs front and rear and four-wheel ventilated brakes with dual pressure cylinders on each.

Louis Meyer, three-time winner of the Indianapolis race, is driving for Robert Bowes of Indianapolis, using the same eight-cylinder in-line supercharged motor of 179 cubic inches that he drove last year, with some modifications to produce greater speed. Wilbur Shaw will drive the same car he entered last year, altered to develop greater horsepower. Floyd Roberts, 1938 winner, is likewise driving the car he used last year. Babe Stapp is driving an Alfa Romeo owned by William S. White of Indianapolis, and Kelly Petillo is driving his 1938 car. Ronnie Householder is driving for Leon Duray, using a supercharged 183-cubic-inch four-cylinder engine in a new chassis.

This year the race is much more than a thirty-three-cornered battle. It is a competition between supercharged and non-supercharged engines, between four-cylinder, six-cylinder, eight-cylinder, and sixteen-cylinder engines, between designers who think moderate horsepower plus reliability is best and other designers who are banking on much more powerful engines for greater speed.



Turning solid billet of metal in lathe to create counterbalanced crankshaft for four-cylinder engine

strument board in the driver's cockpit is mounted on springs to reduce vibration. The car has a duralumin body and weighs 1,900 pounds.

Fred Offenhauser, well-known race-engine builder, is finishing a six-cylinder, 265-cubic-inch non-supercharged engine for Joe Lencki of Chicago. It will develop about 225 horsepower. The motor has three carburetors. Due to lack of room in the spherical combustion chambers two valves instead of four per cylinder are used.

Another Offenhauser was built for Anthony Gullota of Kansas City, to power a car to be driven by Ralph Hepburn. This is a conventional four-cylinder racing engine of 270 cubic inches, developing about 225 horsepower, and employing four valves per cylinder and two camshafts. Another four-cylinder Offenhauser was built for Ted Horne, owner and driver. The motor

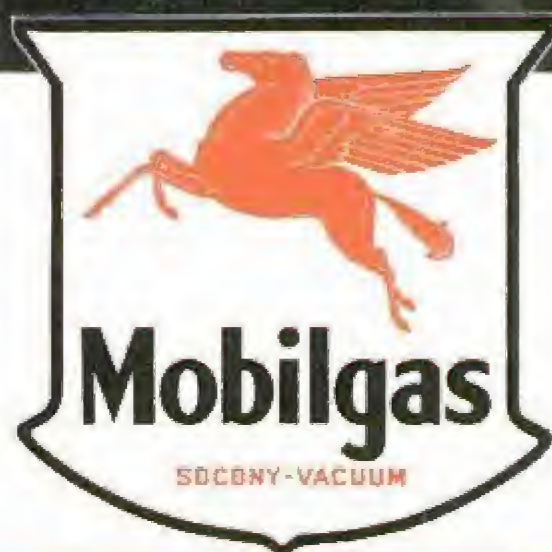
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MOBILGAS

For Balanced Performance

Challengers of Disaster

(Continued from page 725)

ground-floor doors and windows. When the Connecticut's rising waters again threatened the buildings in 1938, the operators moved to upper floors and the bulkheads were put in place and calked. The river rose to within two feet of its 1936 level but the bulkheads held. As a result, telephone damage in Hartford during the hurricane due solely to high water was comparatively slight.

In many sections of the stricken area, emergency batteries and power plants were ready to be hooked up to supply light and power when regular sources failed. The carefully planned, standardized equipment, the results of years of research by

backbone of eastern seaboard communication—failed just before the full force of the hurricane struck, when a normally quiet stream went berserk and demolished a bridge at Atwoodville, Conn., a few miles above Willimantic where the cables crossed. A section of an important route between Norwich, Conn., and Providence, R. I., was practically demolished, as was the New Haven-Providence line which runs along the shore. This was caused by falling trees. The Springfield-Albany cable and the most important cable route entering Vermont were severed when a bridge over the Connecticut river at Chicopee Falls was carried away.

Lines entering Vermont from New Hampshire were also down. So many cities and towns in these two states were temporarily without service that both were virtually "off the map" for a time. So was the western part of Cape Cod when a bridge washed out at Wareham, Mass., severing a cable.

This was the situation faced by the challengers of disaster. Nearly a half million telephones out of commission. Lines down. People dead and dying.

Before the first rescue workers had taken the field, 8,000 disaster fighters in the area were already stringing wires and erecting poles. But the work had to be speeded up. And so, as the first emergency lines were erected and circuits completed, telephone companies in other states learned of the havoc and immediately mobilized their forces.

"Men and materials, these were the vital requirements," says an official of the American Telephone and Telegraph company. "Almost at once there appeared on the highways and streets of these stricken territories telephone trucks—singly and highballing in convoy behind police escort—bearing the license plates of distant states. Plants as far west as Illinois slipped into well-oiled emergency gear, all coordinated in one effort to one end—to get the supplies into New England and Long Island where they were needed, as they were needed and all that was needed. They did. By the second week after the disaster, more than 2,300 trained men and

(Continued to page 120A)



Putting a cable across a raging torrent after the bridge had been swept away by high water

engineers and scientists of the Bell telephone system, made it possible for a challenger of disaster from a distant state to step in and utilize that equipment as familiarly as his own. To that extent, science had anticipated and forestalled disaster.

Fighting against the forces of nature, however, was another matter. As the lines went out by thousands, the remaining ones were needed for more and more messages, first for summoning aid and directing rescue, then, as the toll of the dead and injured mounted, for information by relatives, and individual pleas for assistance.

The A, B and C cables between New York and Boston—the "underground"

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FOR MANY
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FOLKS TO GAIN
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THOUSANDS GAIN 10 TO 25 LBS. NEW PEP, BETTER LOOKS —with Ironized Yeast Tablets

NOW thousands of thin, run-down people can say goodbye to skinny bones, tired feeling and nervous crankiness. For with these scientific, easy-to-take little Ironized Yeast tablets, great numbers who never could gain before have put on 10 to 25 solid pounds, gained new pep and strength—in just a few weeks!

The reason is simple. Scientists have discovered that many folks are skinny and jittery—can hardly eat, sleep or work—only because they don't get enough Vitamin B and iron from their daily food. Without these vital substances you may lack appetite and not get the most body-building good out of what you eat.

But you can now get these exact missing substances in these pleasant little Ironized Yeast tablets. So with them thousands of men and women have easily put on just the pounds they needed, gained new pep and natural attractiveness they hardly ever hoped to have.

Make this convincing money-back test

Get Ironized Yeast tablets from your druggist today. If with the first package you don't eat better and **FEEL** better, with much more strength and pep—if you're not convinced that Ironized Yeast will give you normally attractive flesh, new energy and life, the price of this first

package promptly refunded. Only be sure you get the genuine Ironized Yeast, and not some cheap, inferior substitute which does not give the same results. Look for "IY" on each tablet.

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To start thousands building up their health right away, we make this special offer. Purchase a package of Ironized Yeast tablets at once, cut out the seal on the box and mail it to us with a clipping of this paragraph. We will send you a fascinating new book on health, "New Facts About Your Body." Remember, results with the first package—or money refunded. At all druggists. Ironized Yeast Co., Inc., Dept. 535, Atlanta, Ga.



Don Russo

Gains 14 lbs., strength, energy

"I had been losing weight and had no pep or energy. I looked so bad I was ashamed to go out and meet anybody. Then I tried Ironized Yeast. In 3 months I gained 14 lbs. My new huskiness and pep has brought me lots of new friends."

Don Russo, Phila., Pa.



R. Loeffler

Gains 12 lbs., admired now

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(Continued from page 118A)

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... and a built-in **VIEW-FINDER** too! ... The **NEW UNIVEX** is tops!



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GREATEST**

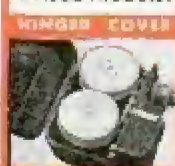
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Everybody's talking about it! The new 1939 Univex that gives you the simplicity of operation . . . the dependable performance . . . the thrilling, true-to-life results you'd expect only from high-priced movie cameras! Check its sensational features! The new, faster f4.5 lens! New built-in optical view-finder! New snaplock hinged cover! New improved governor! New automatic shutter! Powerful, quiet motor—and many others! No wonder Univex can guarantee "satisfactory movies or a new roll of film free!" Film for the new Univex costs only 69¢ a roll—actually making movies cost less than snapshots!

See America's greatest movie camera value—the new 1939 Univex—at your dealer's today. (Many dealers are now offering convenient easy-payment terms.)

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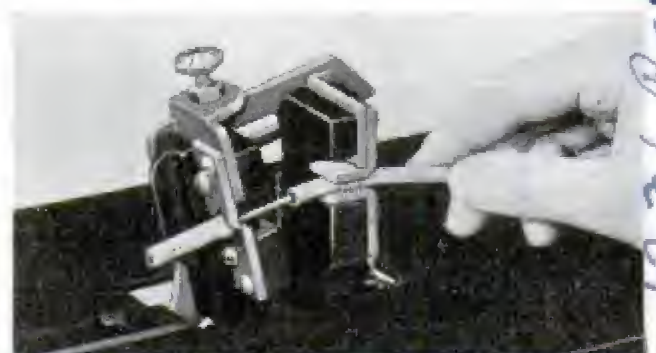
615 motor vehicles had managed to roll into the territory, loaned by fourteen telephone companies.

When a bridge at Chicopee Falls, Mass., collapsed and carried important cables away, the disaster fighters tried various methods of getting a line across the 700-foot-wide torrent. When other methods failed, they called the Coast Guard. From Rockaway, Long Island, a chief boatswain's mate flew to Chicopee Falls with a Lyle gun. Standing on the bridge approach, he loaded, aimed, fired. The projectile easily cleared the turbulent river and carried a light line with it intact. With this, rope was pulled across, to be followed in turn by wire and then by strand. Soon linemen were riding it to rig up temporary circuits. By morning, a new section of cable, placed and spliced, was supported high above the roaring river.

Radio telephone service, one of the newest offerings of science to the disaster fighters, played an interesting and important part in bridging gaps in telephone service. The ultra short-wave radio telephone station between the New England company's station at Great Harbor, Mass., and Provincetown afforded the only communication between Cape Cod, Provincetown, Hyannis and the rest of the world. Portable equipment provided a link between Boston and Keene, N. H., and other points of that state. These emergency radio circuits carried a heavy load of traffic until physical circuits were restored.

Foot-Operated Wire Stripper Leaves Hands Free

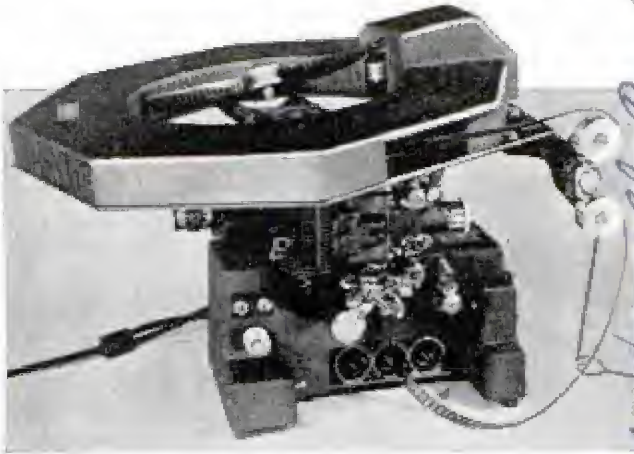
Mounted on a bench and controlled by foot pedal, a wire stripper removes insulation cleanly from eight-gauge to the finest electrical wiring. Open side feed keeps the material always in view, and hands are free to guide the work.



A deal computer

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Continuous Projector for Movie Eliminates Film Scratching



Horizontal attachment on movie projector permits continuous projection and eliminates friction

Continuous projection of movies is offered in an attachment that can be installed on several models of sixteen-millimeter projectors. Its reel is mounted on a horizontal plane. This attachment eliminates friction between film layers and thus prevents film scratches.

Streamline Auto Smooth as Egg Gives Driver Wide Visibility

Under production in a German automobile plant is a streamline car with an exterior almost as smooth as an egg. The broad windows form a band of glass that



Approaching the ideal in streamline form, this automobile is in production in Germany

nearly encircles the car, giving the driver unusually wide vision forward and to the sides. It has a low center of gravity, the roof of the automobile coming scarcely to the shoulders of pedestrians.

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Here's the only completely All-American Made camera that gives you the speed, the performance and the prize-winning results you'd expect only from the most expensive foreign makes! Think of halting a 200-mile-per-hour racing automobile! A shutter with $\frac{1}{1000}$ th-of-a-second speed gets it—true, sharp, clear! Think of taking perfect nighttime shots—indoors or out! The built-in photoflash synchronizer switch makes it easy! Think of cutting your negative costs in half! The most economical Univex 35 mm. film makes it possible!

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● A sparkling glass of Alka-Seltzer, should be your first glass of defense against the pain, misery and discomfort of common everyday aches and pains.

Too much rich food—too much work or pleasure—too much eating, drinking or smoking—these are the common excesses that cause **TOO MUCH ACID**, and **EXCESS ACID** usually goes hand in hand with Headaches, Acid Stomach, Distress of Colds and Muscular Aches and Pains. If you're wise—you'll alkalize. Take a sparkling glass of Alka-Seltzer. It's a pleasant, effervescent alkalizing solution and pain reliever. Alka-Seltzer was unknown seven years ago—*today* it is used by more than 20 million people. All druggists have Alka-Seltzer in 30 and 60 cent size packages.

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in a few weeks earn big income in service fees,—not medical nor chiropody—easy terms for home training, no further capita needed, no goods to buy, no agency. Established 1894. Address Stephenson Laboratory, 1 Back Bay, Boston, Mass.

181570
How Smart Is Your Dog?

(Continued from page 709)

he'll soon find out the street is forbidden.

That, by the way, is part of the training against crossing streets in traffic. The dog should learn to sit at the curb until traffic is clear. Some say the dog can learn to recognize green and red traffic lights and obey them; most trainers believe dogs are color-blind, and simply respond to traffic conditions. When automobiles come to a stop in one direction, the dog knows it is safe to cross. Von Motzeck is not convinced about the color vision of dogs. His trainers have tried teaching pups to pick up the colored ball named from a group of balls of assorted colors, and they've had some success. But they aren't certain whether the dog really recognized the color or was just too smart—he may have identified the balls in his mind by smell, or it may have been pure guesswork. Half the time the dog would watch his trainer and try to fool him into giving away the answer by a telltale glance or movement toward the right ball.

What about the dog with the superbrain, the dog that can add and subtract, read numbers on a blackboard, even spell out words by barking once for "A," four times for "D," and so on? Does he actually reason it out, or are we being "taken in?"

Well, no college-educated dog is going to spill his trade secrets for you, nor will his master. After watching a smart young fellow in a snappy wire-haired suit bark the answers to multiplication and division problems for a theater audience, you need not expect to go backstage and have his trainer tell you the dog actor really hasn't a brain in his head, it was all a simple little trick.

Nevertheless, it's pretty safe to say dogs can't learn a multiplication table any more than a six-months-old baby. Watch the dog performing and you'll never discover the deception. Watch the trainer and you might. You might observe that the dog, told to count eight, stops barking at the count of eight just as his master moves a finger almost imperceptibly, or flutters an eyelid. You'll notice that the dog is paying concentrated attention to his master. Somewhere he caught a signal.

A famous newspaperman was once fooled into believing a dog could answer prob-

lems in arithmetic by his own reasoning power. Well, you'd have been fooled, too. The trainer stood with his back to the dog, uttering no word. The newspaperman was allowed to put the question: "Divide twenty-seven by three."

Immediately the animal started barking. At the count of nine he stopped. The newspaperman never "caught on." He never discovered that the dog stopped "counting" the instant he saw the trainer's toe move a fraction of an inch to the right.

Not every dog is clever enough to learn "arithmetic." More significantly, not every dog owner is clever enough to teach it. It takes obedience, persistence, control. One method of beginning the lesson in numbers is to say: "Count five," or "What's three plus two," while you hold a piece of meat for the dog. He'll bark for the meat; at the fifth bark let him have it—naturally he'll stop barking. Keep up this routine with various numbers. Gradually cut down the size of the meat, but always use the same gesture. Eventually the dog should respond to the gesture without the meat, until he will stop barking at a finger flick the audience would never notice.

An old method of teaching a dog not to jump up on people was to step on his toes. That sort of training doesn't go with von Motzeck. Another method is to grasp the dog's forepaws when he jumps and make him walk backwards a few steps. They don't like that. Von Motzeck's method is to invite the dog up, beg him to paw you, then thrust your knee into his chest to push him away. A few repetitions and the dog will never offend again.

That is the basis for one clever stage stunt. A vaudeville actor will introduce his pup to the audience as the brightest dog on the circuit, a dog that obeys infallibly and never makes mistakes. Then he'll call the dog to him and the dog will sit down; he'll order him in exasperated tone to sit and he'll come running; he'll beg him to jump up and instead he'll lie down. And so on, always acting contrary to the spoken order the audience hears, but responding to the gesture or tone of voice which means something else.

One of von Motzeck's most dangerous jobs is to train watchdogs for attack work. He has been torn many a time by dogs who learned their lessons too well. Teaching a

(Continued to page 124A)

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Shaves with This New**

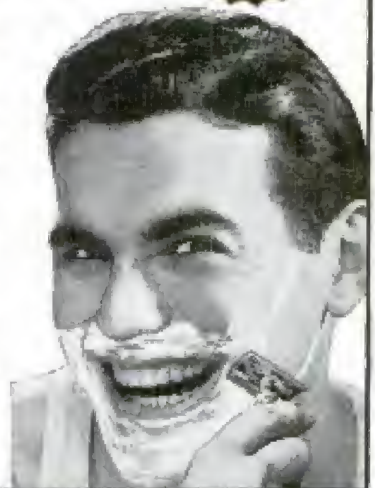
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5 for 25c





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If you prefer, ask your garage or service station to use Sani-Flush in your radiator to clean it out. Motors run cooler. Power is saved. You may save expensive repairs. Sani-Flush cannot injure motor or fittings. You'll find Sani-Flush in most bathrooms for cleaning toilets. Sold by grocery, drug, hardware, and five-and-ten-cent stores. 25c and 10c sizes. The Hygienic Products Company, Canton, Ohio.

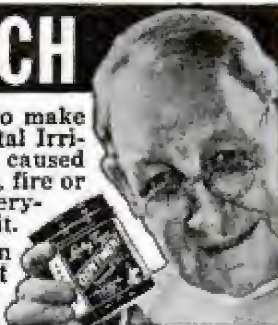
Sani-Flush *Safe*
KEEPS RADIATORS CLEAN *NOT CAUSTIC*

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Lucky Tiger Ointment is made to make itchy folks happy. To allay Rectal Irritations — To correct externally caused Pimples — To soothe insect bites, fire or sunburns. To make friends everywhere. Thousands never without it.

Antiseptic to minor wounds when in proper contact as bandage. At Druggists, Barbers, 10¢ Stores—

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dog to protect a baby from kidnapers or to guard a cash register or safe or a woman's purse is ticklish business. You have to get it across to the dog that it's a game between him and his tutor but serious business when he's really on guard. The attack dog is taught to leap for the throat of an intruder and knock him down, or to carry out any other specific plan of attack desired. Von Motzeck won't put any dog through the attack course unless convinced there is real need for that protection.

Your dog has a head on his shoulders. It's your responsibility to develop his brain and his personality. Treat him as an individual. Make him respect and obey you. Keep up his training at least fifteen minutes every day. If he's ill-mannered and surly, people will say—like the neighbors about unruly children—"It's his home training." But if he's alert and well-mannered they'll tell you, "Smart dog."

Electric Fan at Base of Table Blows Cool Air from Floor

On the hottest days next summer you can eat your meals in comfort if you have an "air conditioned" table with a fan built into its base. A gentle breeze rising from the floor, where it is always coolest, is deflected by a special plate to prevent drafts. Diners' feet are kept from the whirling blades by a grating around the unit.



Fan beneath table guarded by grating keeps diners cool with refreshing breeze on hot summer days

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Our free plans show you how to build a successful business of your own sharpening lawnmowers. Most men earn up to \$25 a week, even in spare time. Howard Hellen, Minn., writes, "I sharpened 745 lawnmowers, sold 60 used mowers and grossed \$1100.00 from April 5 to Sept. 15." Roy F. Stier, Wis., writes, "I paid for my Ideal Sharpener in exactly 36 days." Like magic, the Ideal Lawnmower Sharpener makes old, dull, badly worn mowers cut like new. Simply set the mower in the Ideal, make a few simple adjustments and the machine does the rest. Sharpens any mower to perfect edge in 15 to 20 minutes—usual charge \$1.00 to \$1.50. Attach to light socket. Start in your basement or garage. Work spare time or full time. Attachments for grinding skates, grass shears, hedge shears, sickles, scythes and axes, FREE CATALOG tells complete story.

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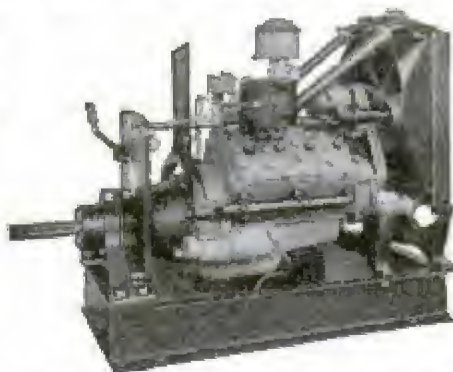
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Seeing the World in Ten Minutes

(Continued from page 699)

Ever since the conquest of Ethiopia, which newsreel companies found a costly and generally unsatisfactory adventure, the many battles and dramatic incidents in Europe and Asia have been conducted on a scale and over an area difficult to cover as a newsreel subject. Yet a destiny-conscious public demands them and those demands are filled by fearless cameramen.

Covering a war zone assignment today, the newsreel man is insured and the monthly premium paid by his company is approximately \$500. His sound camera equipment costs approximately \$10,000. Since most of his shots must be made on the run and over wide territory he uses a small hand camera costing approximately \$1,000 and equipped with telephoto lenses. It places him in great danger, as many an adventurous cameraman has discovered, for, from a distance he might well be mistaken for a combatant with a gun.

The occasional lucky break—being on the right spot at the right time—still does occur. It happened on December 12, 1937, when Norman Alley of Universal Newsreel and Eric Mayell of Fox Movietone News were on board the U. S. Gunboat Panay in the Yangtze river, when she was bombed and sunk by a Japanese plane.

The newsreel picture record made on that dramatic occasion was so important that it was rushed to Manila by a destroyer and, closely guarded, flown to America where a special print was run off for the State Department. It cost nearly \$25,000 to deliver this "break" to the newsreel office but considering the tremendous crowds which came to the theaters to see it, it was worth the expense.

The modern cameraman, in addition to being an expert with his equipment, has had to learn diplomacy—especially in the dictator countries where he sometimes has to resort to clever smuggling to avoid the censors. A difficult job for foreign news correspondents who can put their story on a few sheets of paper, it is more difficult for the cameraman handling bulky film.

Once the newsreel footage is on its way, however, and the censor safely behind, things move fast. An express liner or airplane rushes it to New York where a waiting motorcycle speeds it to the newsreel

K1514

office. Quickly developed, it is dried and taken to the projection room for the waiting editors and technicians. Then things really begin humming, for where the subject has been shot "silent," the comment, music and incidental crowd or other noises must be "dubbed in." The destiny-making subject—Chamberlain returning by airplane from his interview with Hitler, the Germans marching into Czechoslovakia, the defense of Madrid, or whatever else it may be, is projected once in the negative, which is handled quickly but with extreme care as it scratches easily. Meanwhile other subjects, national, features, sports, have been developed and projected. Five thousand feet or more may be run off.

After the last foot of negative has been run off, a conference is held. Those 5,000 feet must be trimmed down to 1,000. The running comment must be written quickly from "dope sheets" supplied by the cameramen. Additional material must be looked up to give the commentator a smooth continuity. In a surprisingly short time the reel is ready to be put in sequence. "Dramatic smash first," says Mr. Ullman, "Sports last." And if it's during football season, theater goes on a Saturday night will see action pictures of prominent games played that afternoon.

The edited reel flashes on the screen. The commentator reads his voice into a microphone to suit the action. In the sound booth the music editor turns on his canned music, works his sound effects as the voice of the commentator is piped in. The sound man mixes them all, letting the sound and music "come through" where the narrator pauses. The sound goes onto a raw film to be added later to the reel.

The multiple printer, turning out fifty prints an hour, begins clacking. And in five hours the newsreel, ten minutes of destiny, is ready for the theater.

The shipping department pounces on the reels. By plane and fast express to all parts of the country they go. By plane and steamer to all the civilized world. But as far as the newsreel cameramen and editors are concerned the reel just finished is already an old story. In the editorial room, the news teletype is clicking out more news of great importance. The assignment editor reaches for telephone and cable blanks. The next newsreel make-up night is just three days away.

Daddy, what's a Jollop?



Young Buster and I are manicuring the lawn and chinning together when he pipes up, "Daddy, what's a jollop? Tommy Beals says we have one." Well, for the love of Mike! I happen to know Bill Beals' bus is a couple of years older than ours!

Now next door I notice Bill Beals fussing around his car, so we mosey over for a look. And there is Bill putting the final licks on as nifty a polish job as I ever saw. When my eyes get accustomed to the dazzle, I see he's been using something out of a green can with a big 7 on it.



So I take the hint and get a can, which turns out to be Du Pont No. 7 Polish. Well, I remember polishing as a tough job. But say, with this No. 7 I take years off the old bus' looks in no time. A jollop, is it? Look, before you can say "No. 7 Polish made by Du Pont," I have that car shining so bright I tell Buster to run and get my dark glasses!

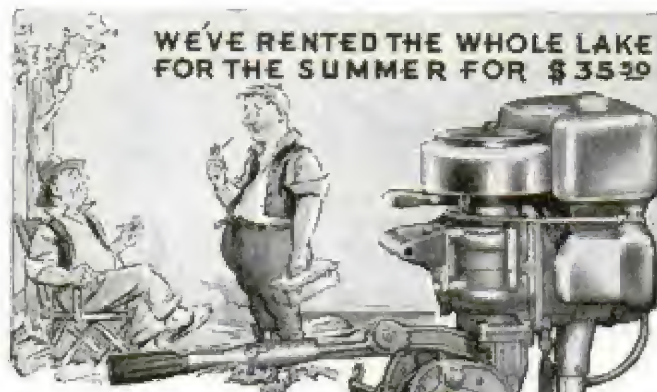
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"Bathtub Gardening"

(Continued from page 733)

shine, the young plants burst almost overnight from the seeds, then disappeared as quickly as they came. The young hydroponics farmer discovered that he had unexpected enemies with which to cope in the rats and birds that infested the island. Raising his tanks on stilts to defeat the rats and caging the garden to keep out the birds, he soon had a new crop on its way. Within three months, he was supplying the



Dr. and Mrs. Gericke picking their hydroponics-grown tomatoes with aid of stepladder

inn with tomatoes, radishes, lettuce, and a short time later, corn, beans and table flowers. The original "bathtub gardens of Wake," as fascinated visitors called Lau-meister's farm, quickly passed out of the experimental stage and was increased tenfold in size by Pan-American Airways, which is now planning similar "farms" in other out-of-the-way posts where fresh vegetables are costly to bring in.

Another project which vindicated Dr. Gericke's prophecy of commercial success for hydroponics was the greenhouse tomato farm of Ernest Brundin in California. Brundin saw possibilities in tomatoes ripened for mid-winter, when prices were at

a peak. His outstanding contribution to liquid farming was a means of heating the fluid economically. Dr. Gericke's scheme was to use soil-heating cables in the tanks, but this proved so costly that the first commercial tomato grower to try the method failed because of the prohibitive cost of electric power. The Brundin method connects a hundred tanks in a huge greenhouse with a centrally located sump, where the liquid is raised to the desired temperature by steam boilers, then boosted under pressure back to the tanks by a small pump. The nutrient liquid trickles by gravity back through pipes to the sump. Thus the plants dangle their roots in constantly moving streams which make the round trip from sump to tanks four times every twenty-four hours.

Brundin tests his nutrient at least once a day and if it is deficient in any of the necessary plant foods, he adds that at the sump and within a few hours, every plant on the farm is healthy again. Under ordinary circumstances, the nutrient leaves the sump at seventy-six degrees and comes back about four degrees cooler. However, if Brundin wants to hustle the ripening of his tomatoes to catch a certain high priced market, he can give them the speed up by raising the temperature to eighty degrees.

Among the other large commercial growers is the California Packing Corporation, which maintains a 100-tank "farm" near Sacramento, under the direction of a former student of Dr. Gericke's. On this farm, the liquid culture farmers are "working backwards," to find out what nutrients tomatoes and other vegetables need to make them more solid after they are canned.

One of the most potent commercial possibilities is the discovery by Rolland Langley of Mountain View, Calif., that mushroom spore will run along excelsior moistened by liquid nutrients, just as it does in manure beds. The bane of mushroom growers is the back-breaking work involved in hauling the used manure out of the cellars and bringing in the new, every six months or so. If the mushroom experiments prove a commercial success, all they will have to do is turn a spigot and run the used plant food out.

Progress in hydroponics is not confined to the universities that have taken up the science, notably California, Purdue, Illi-

(Continued to page 130A)

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(Continued from page 129A)

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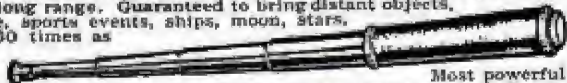


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nois, Wisconsin and Rutgers, and the big commercial pioneers. Several score dealers in plant nutrients are now offering their wares to amateurs, ranging from packets containing a nickel's worth of salts that sell for a dollar to reasonably priced complete kits that are practically fool-proof. In several communities there are now hydroponics gardening clubs which provide the means of swapping experiences. The most successful amateurs have been those with small greenhouses in which they can control temperature.

One of the truly astonishing fields for hydroponics has been its use in schools, where thousands of teachers, particularly in the western states, are using liquid culture as a method of visualizing botany. The trays can be lifted out of the tanks day after day to let the youngsters see how the root system develops parallel to the plant growth. Langley is also the pioneer in this field, being the originator of a small leakproof window-box hydroponics kit complete with tank, tray, excelsior, rice hulls, and the plant nutrients. The latter are so arranged that when plants develop "the yellows," or any other ailment, the class can give them the proper "medicine" and note the improvement.

At the San Francisco Golden Gate Exposition is a hydroponics garden. In place of the customary wood or metal tanks, glass tanks are used, enabling visitors to study the private lives of plants from the topmost bud to the deepest root tip.

This exhibit offers a cue for perhaps the simplest and least expensive means of trying "bathtub farming" in your own home. Get out the old goldfish bowl, bend a piece of wire netting to form a tray two inches deep to hold excelsior and rice hulls, or some peat, for the seed bed, purchase plant food ingredients from your chemist or from a dealer in hydroponics materials, and try the new plant magic.

Different plants thrive on different diets. Also, a combination of "foods" that may make a tank garden thrive in one climate, where sun is plentiful, may throw the plants too far on the acid side, on the one hand, or the alkaline side, on the other. On the large hydroponics farms, the "P.H." balance, as this is known, is determined by test daily. For the amateur tank gardener, there is no simple substitute at the present for trial and error.

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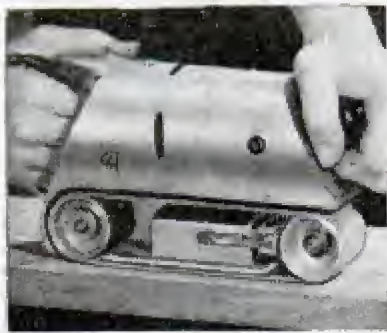
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At the Throttle of the "Century"

(Continued from page 651)

Had I been going fast, we might have had a serious accident. Now that I'm nearing seventy years of age, I've learned the danger of speed on the highway and most of my driving is under fifty. But in spite of that, I feel a lot safer in the cab of the "Century" when it is doing eighty than I do in my car at any speed.

Railroad equipment, particularly the locomotives, has improved wonderfully since I started working for the New York Central nearly fifty-three years ago. Then I was with the old Lake Shore and Michigan Southern, which later became a part of the New York Central. The last few years, especially, have brought a lot of progress.

In the early days the railroads lost a lot of time by having to take on coal frequently. Today, between Chicago and New York, three locomotives are used on the "Century." Each is coaled before it is hooked onto the train. The change of engines requires only about three minutes. This eliminates the jolting of passengers that would result from moving the train from one coal chute to another. It's a hard job to handle a heavy train at the coal chutes.

Taking on water today isn't a problem because we can scoop it up on the run from water pans placed between the rails. At sixty miles an hour, our locomotive can take on 5,000 gallons of water while running over a water pan 2,000 feet long. The pans are heated by steam in winter to keep the water from freezing. As soon as a locomotive passes, a pump starts refilling the pan.

One of the biggest contributions to railroad safety is the automatic block signal and automatic train-control system. It's a wonderful thing, that train stop. Running through a storm, if the fireman and I both should miss a signal, the train stop will do the job of setting the brakes. About eighty feet in front of the signal post is a magnetic element in the track. In the front end of the locomotive tank is a receiver. The magnet operates an actuating valve which unlatches the automatic brake and sets the train brakes, stopping the train. Then the fireman must get down on the ground and latch the automatic brake control before the locomotive can be moved.

Speaking of brakes, I remember an in-

cident in 1895 when I was first firing on a freight run. Our train was equipped with the first air brakes used on a freight on that line. We were coming downgrade with twenty-four cars of ore. Because too few of the cars were equipped with air brakes, and those all at the front of the train, the engineer was whistling every few seconds for the train crew to set the hand brakes on the cars. South of Ashtabula, Ohio, our tracks crossed those of the Nickel Plate railroad. Looking ahead I could see the target set against us. That meant that a Nickel Plate train was blocking the crossing. Our train kept rolling faster and faster because the crew didn't have time to set the brakes before we would reach the crossing. I got down on the gangway, ready to jump, and told the engineer he'd better do the same. We were pretty close to that crossing when the target changed suddenly and our train tore through at about forty miles an hour. The crossing watchman had heard our engineer whistling for brakes and had gotten the Nickel Plate crew to split their train in time for us to go through the crossing. We ran a couple of miles before we could get our train under control.

Once on a switch engine, the live pipe to the left injector let go and I had to dive out the window head first. If I had taken a deep breath of that hot steam, it would have burned my lungs.

But accidents are comparatively few. The new locomotives are built for greater endurance and higher speeds. The parts are heavier and manufactured of tested materials. Maintenance is much better than in the old days and this is especially true of lubrication. The boys in the round-house grease the engine, then take it out on the getting-ready track and go over the rods again to be sure the grease has reached every spot.

The new "Century" engines are much faster and able to take it. They are built for a top speed of 120 miles an hour, but operating regulations forbid speeds much greater than eighty. The weight per yard of rail has been increased from sixty to 127 pounds in order that trains may be operated at greater speeds with safety.

The first 20th Century pulled out on June 15, 1902. I was her fireman on the second run. Then our running time to New York was twenty hours. In 1905 the

(Continued to page 135A)

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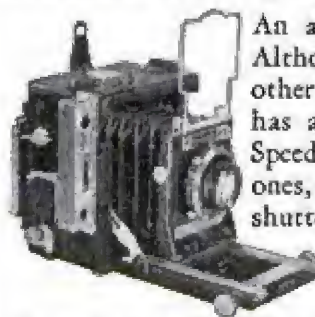


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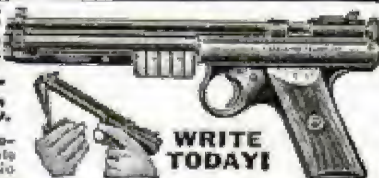
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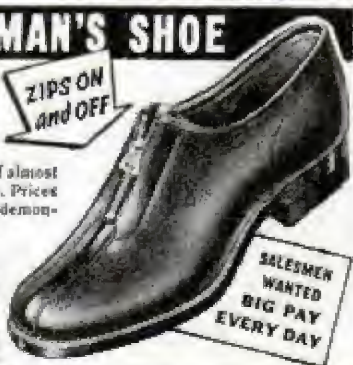
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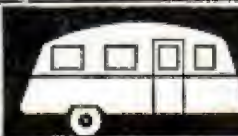
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(Continued from page 133A)

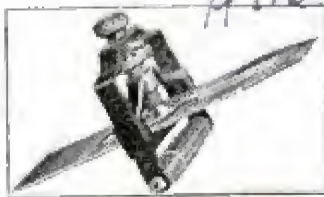
schedule was cut to eighteen hours. From then until 1933, the schedule varied between eighteen and twenty hours. That year it was cut to seventeen hours and forty-five minutes. The time now has been reduced to sixteen hours—and it's pretty sure to go lower as improvements and operating conditions warrant.

Every engineer has at least one pet crossing where he hangs onto the whistle. At Mishawaka, Ind., I never let go, because between Mishawaka and Elkhart there are several important highway crossings. My engine hit an automobile there in 1929. Fortunately no one was killed. It happened as we met a silk train going east. Just as that train's caboose cleared the crossing, the car shot across and right into our path. Since it came from the left, I never saw the automobile until after we hit it.

Many people ask me what they should do if their car stops on the railroad track and a train is coming. I think they should get out of the car immediately and try to push it off the track, instead of trying to start the engine. Then, if they can't get it off the track, they are in the clear, ready to jump to one side when the train gets too close. But my advice to all motorists and pedestrians is this:

"Stop, look—and wait for the train to go by."

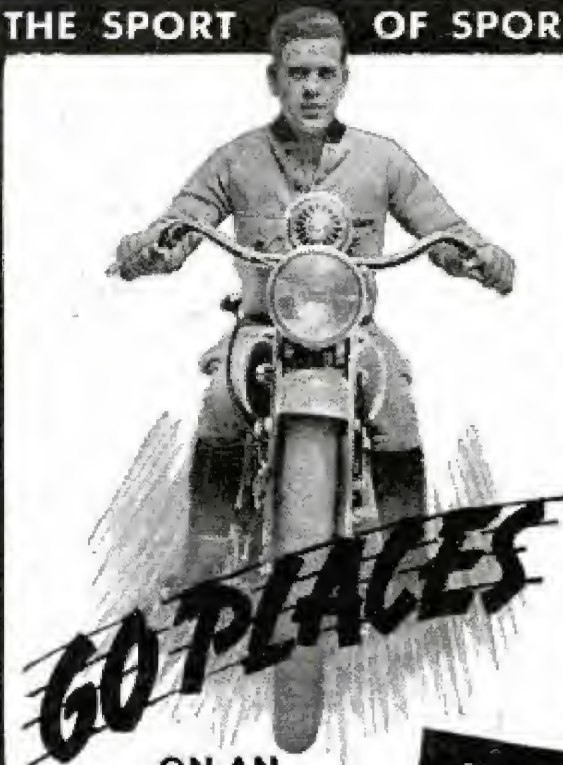
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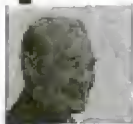
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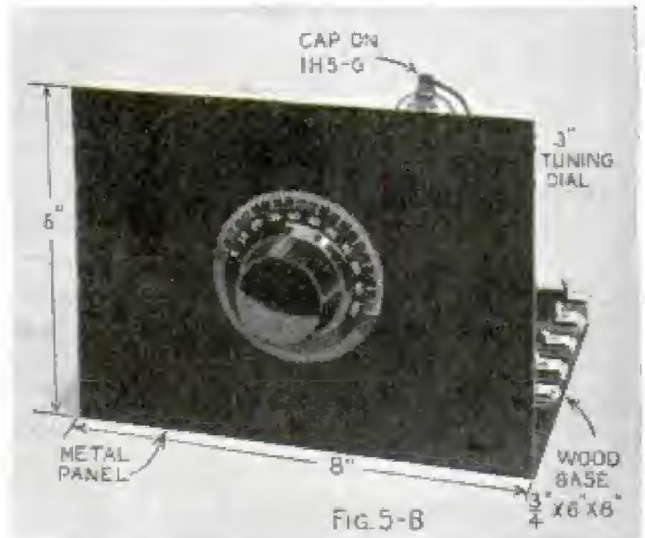
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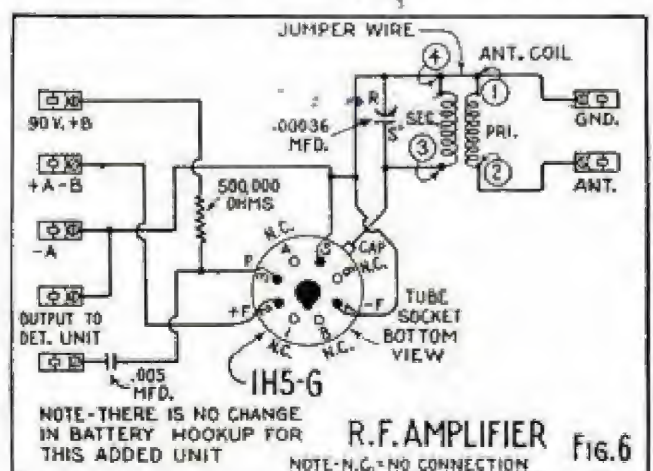
(Continued from page 740)

prong. These connections are all shown top view, in "X-ray" fashion, in the simplified wiring diagram, and bottom view in the schematic. The Amphenol sockets specified for all three units have each



prong clearly numbered on the under side; solder all wires to the socket terminals before mounting on the baseboard.

All battery connections are automatically made when the jumper wires are used to connect the units together. The antenna coil is a standard Litz-wound unshielded type and each connection is plainly indicated in Fig. 5 and the insert detail A, which shows a view looking down into the



top of the coil form. Front and rear views of the completed r.f. unit appear in photos Figs. 5-A and 5-B; and a front view of the final R-266 three-unit assembly is shown.

When tuning the 3-unit set keep the dials on the detector and r.f. stages at about the same setting. Use a 50 or 75-ft. antenna and a good ground for best results.

Synco JIG SAW

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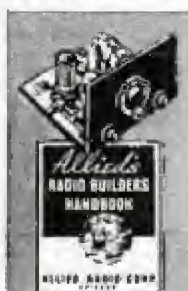


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☐ Enclosed find 10c (plus 3c postage) for Builder's Book
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FREE
Catalog

"On-a-Chair" Cabinet

(Continued from page 739)

edges with the molding shown in the insert detail in Fig. 7, you can simply make a chamfered edge with a hand plane.

The ash well is formed from a short length of 2½-in. diameter chrome tubing by soldering a disk at the bottom and a 3¾-in. flange at the top. The flange is turned to size from soft sheet brass on your lathe face plate, first turning the outside diameter and then the inside; this is then nicked to match the tube before soldering. Small cigarette holders bent from disks of shiny tin are soldered to the top surface of the flange after first filing off a spot of the plating so that the solder will adhere. See that the tube fits the hole freely for easy removal. A standard 3½-in. electric clock movement can be mounted in the opposite shelf.

Two metal straps hold the cabinet to the arm of the chair; these are bent from ¼ by

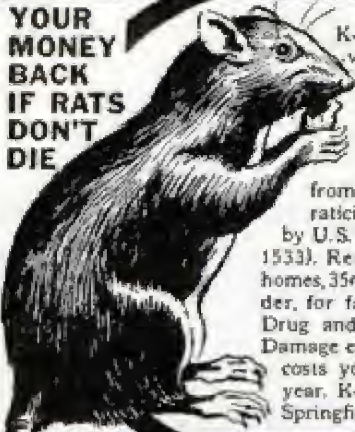
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- 1 pc.—½" x 12" x 12"—Plywood
- 2 pcs.—¼" x 1¼"—Strap iron (approx. 30")
- 1 pc.—2½" dia. x 3½"—Chrome tube
- 1 pc.—10 ga. 4" x 4"—Soft sheet brass
- 1—3½" standard electric clock movement

1¼-in. strap iron. The proper contour may be determined easily by bending a length of wire solder around the chair arm as a pattern. To make sharp bends in the iron you will probably have to heat the metal at the point of bend; however, the curve may be formed cold by working it to shape in the customary manner through the open jaws of a monkey wrench clamped horizontally in a vise. From the insert photo in Fig. 6 it will be noted that the straps are shaped to pass down alongside the cushion of the chair and hook under the lower upholstery rail of the arm. The straps may be chromeplated, painted or covered with fabric as preferred. When these straps are screwed to the bottom of the cabinet as shown in Fig. 4, they will form cross supports upon which the midget set rests. If set power cord is too short to reach wall socket, use an extension cord. Do not cut or add to the set cord itself. Blueprint number of this article is R-267.

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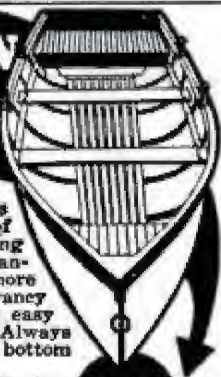
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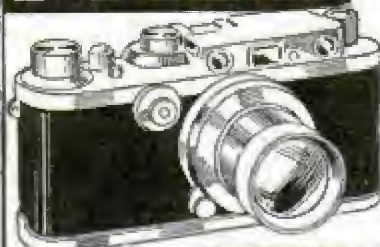
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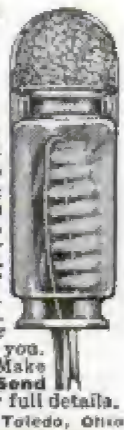
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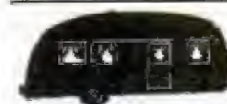


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Listening In on America at Work

(Continued from page 683)

ducers ran into was that of finding Americans at work at the time the program went on the air—10:30 at night. The time has since been changed to Saturdays at 7:00 p.m. This problem first developed when the longshoreman was to bring the story of his job to the microphone. But longshoremen, it seems, are not usually at work at 10:30 at night. So the broadcasting system became the employers of twenty-two longshoremen for the time of the program, paying them the union scale for overtime work. And the S.S. "George Washington," by special arrangement, was unloaded that one time at night.

Submarines, too, are ordinarily daytime workers. So when it was planned to bring to the mike some of these deep sea sailors, the program producers had to get in touch with the Navy department in Washington, which instructed the commander of the submarine base at New London, Conn., to put a submarine to sea especially for the broadcast.

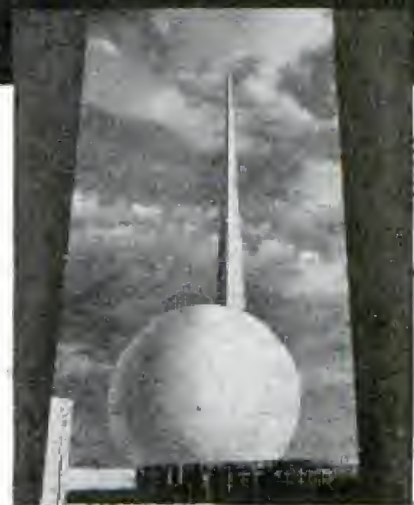
Since the first half of the show always dramatizes the historical background and history of each industry, industrial sound effects must be used. To get the studio sound effects as accurate as possible, experts in each field are brought into the studios—a navy officer, a technical expert from the du Pont company, special technicians from the Western Union company, or the American Telephone and Telegraph company. So successful have these consultations with experts proved that, following the submarine broadcast, for instance, a retired navy officer phoned in. He insisted that the second half of the broadcast, the part that came directly from the underwater boat at New London, was faked. But he accepted the sound effects from the studio as perfect.

One of the most difficult of these sound effects, according to Producer Norman Corwin, was that of dynamiting ice. It was necessary, the experts said, to simulate the explosion, then the sound of the ice buckling and crashing and falling into the water. A thunder drum gave the sound of the explosion all right. But Producer Corwin couldn't get the sound of the ice breaking up. Suddenly he reached in his pocket and

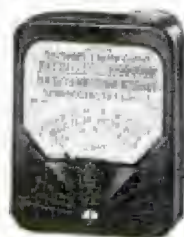
(Continued to page 143A)

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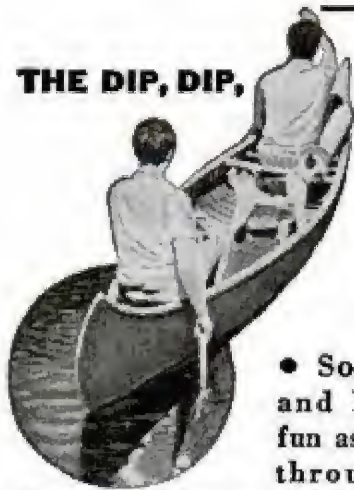
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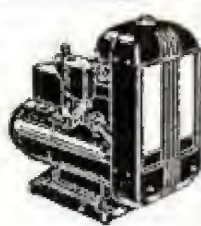
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(Continued from page 141A)

pulled out a dollar's worth of change. When he scattered this on the thunder drum, the effect was exactly right.

When an announcer interviewed a policeman as he drove his radio car through the streets of Los Angeles on his nightly rounds, special arrangements had to be made with the Federal Communications Commission. They granted Columbia permission to re-broadcast that portion of the program on the short wave length used by police cars.

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For the railroad engineer's program, the entire roundhouse at Harmon, N. Y., was put at Columbia's disposal. It took an entire day to get the technical equipment set up inside for the evening's interview between CBS announcer Mel Allen and veteran locomotive engineer "On Time" Bob Butterfield.

In order to get the most accurate picture possible of each industry, CBS sends representatives all over the country. Gilbert Seldes went to Detroit and talked to the men who make automobiles from a spot in the Cadillac factory. On the broadcast about telephone operators, special pickups were made from phone exchanges in three cities, with three announcers at work on a complicated traffic set-up by which each could hear the other throughout the program.

Bob Trout went out to Newark airport and talked to the men whose job it is to guide airplanes into the landing field by radio. The structural steel workers' interview had to come from San Francisco where, because of the time difference between the west and the east coast, structural steel workers were still at work out there when the program went on from New York. To talk to coal miners, technicians and announcers went 700 feet underground in the Marvin colliery at Scranton, Pa.

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Secrets of a Champion Pitcher

(Continued from page 677)

forefinger is to the right of the ball when it is released. Thus you get rotation in that direction.

The knuckle ball is another deceiver and it's not used much because it's hard on the thrower. You grip the ball by the seams with the fingernails of your forefinger and middle finger, imparting a push at the end of the throw by straightening your fingers out. Thrown that way, the ball doesn't spin. It's hard to hit, though the pitcher himself can't be certain just which way it will break. You can conceal the way you are holding the ball until the last second by holding your glove over the throwing hand almost until the instant the ball is released.

Concealment, incidentally, is one reason for following through after the pitch. Keep the arm swinging until the elbow almost hits the opposite knee. The follow through is a lot easier on yourself. Your arm has a chance to slow down without being jerked.

With the emphasis today on the fast ball, an occasional slow ball is often good strategy. This is the change of pace. Here you have a batter at the plate, tense, waiting to take a crack at a ball that he expects will come like an express train. You've fed him one or two fast ones already and he's set for another. Then you drift a slow ball toward him. You've used the same wind-up with not so much steam at the end. Instead of holding the ball tightly you've held it loosely in your hand. It's a slow ball and easy to hit, the only trouble being that the batter recognizes it too late. He's thrown off stride and maybe he waves at it maybe he doesn't. The chances are he won't be able to set himself for the swing.

That's another thing you should remember about the ball. Hold it hard and it's a hard ball. Hold it loosely and it's an easier one. If you grip it tightly for a curve it breaks fast. If you hold it loosely it breaks into a slower curved pitch.

If you throw many curves you are going to learn something else and that is that the direction of the wind is important. If you are pitching into the wind your curved balls will really explode, flying straight at the batter, then changing direction abruptly. If the wind is at your back the curve will be slower and not so sharp.

Incidentally, the way you feel at the start of a game doesn't always indicate what kind of ball you will pitch. I've been hit out of the box in two innings after warming up and feeling like a million dollars. On the other hand one day last summer I felt before the game that I wouldn't be able to throw one good pitch. That was the day I shut out Cleveland with no hits.

Of all the things that go to make good pitching, nothing is more important than control. A pitcher may be great in everything else and can still be beaten if he hasn't control, although much of the so-called wild pitching today results from the slippery ball. This season the league is using one more thread in the stitching to give the pitchers a better grip.

Marksanship is the word for control and the best way to get it is constant practice. You have to rifle a ball that is as smooth as a billiard ball sixty feet five inches through the air and into a space fourteen inches wide and not much higher. To pitch a strike, the ball must not only be over the plate but between the knees and shoulders of a batter. Anyway, from sixty feet away the target is mighty small. A pitcher with good control can hurl the ball into any corner of that space that he chooses. He gets that skill by practice and the best thing to do in practice is to throw at the catcher's mitt, having him hold it at different parts of the target space. When you can hit his motionless glove four times out of seven, you've got good control.

We are going into the ninth now, so here are a couple of final tips. Always warm up that arm before trying fast balls or curves. Lots of good throwing arms have been ruined by starting out cold, without a few minutes of easy tossing the ball around. Lastly, a word for rookie pitchers who think they don't stand a chance because the headliners are so much better than they: remember that you are apt to improve with experience, and the headliners aren't going to stay on top forever.

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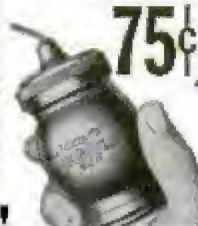
**"JUNIOR"
MODEL 30¢**

Made of Flexophane—throw away when empty—contains 900 applications—individually mounted on directions-and-display card.

Millions of users know Graphite in dry form is longer-lasting and far superior to oil or grease for thousands of miscellaneous lubricating applications. Heat, cold, water, oil, other solvents, pressures, and speeds cannot destroy or displace it. Never hardens, gums, drips, smells, or fails... In other applications, Graphite added to oil or grease makes the truly super-lubricant. A "shot" of Graphite makes everything work, run, or operate noiselessly, drives and keeps out power-wasting friction. Keep a "Gun" near you for daily use in your home, car, work or play.

**RUBBER MODEL
REFILLABLE 75¢**

Lasting, durable construction—for shop, bench and all servicing—often preferred by mechanics. 8 refills cost only 50¢. Full directions on wrapper.



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Users, dealers, jobbers: write Dept. C-G 26
JOSEPH DIXON CRUCIBLE CO., JERSEY CITY, N. J.



**DIXON'S GRAPH-AIR GUNS
AND MICROFYNE GRAPHITE**
PATENTED U. S. AND FOREIGN COUNTRIES

**Amazing New Welding Goggles
Banish Eye-strain**



New bifocal type, permits clear, easy view of work through standard colored lenses. Lower portion, plain, allows quick glance at work without raising goggles. Meets Navy Dept. specifications. Needed by all gas welders. Special discounts to quantity buyers. Price, postage prepaid.

Chicago Eye Shield Co. CHICAGO, ILL. Only \$2.50

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LUCKY TIGER With Oil is made from our perfected formula to help you control unruly hair, and in getting rid of unsightly dandruff—a menace to normal hair and scalp. Also—To allay that annoying itching—To relieve scalp irritations and therefore to aid in checking excessive falling hair and—To groom and beautify the hair.

Get a bottle at druggists or Ten Cent Stores or applications at your Barber's.



FREE! Our New **Lucky Tiger WITH OIL** is now being made for excessively dry hair and scalp. A 35¢ bottle will be sent upon receipt of 12¢ in stamps to pay packing and postage.
LUCKY TIGER MFG. CO., Dept. 31, Kansas City, Mo.

Magic Tubes of Daylight

(Continued from page 643)

drops with falling temperature. Under normal air-temperature conditions of seventy to eighty degrees Fahrenheit, the one-inch fluorescent lamps operate with a bulb wall temperature of 104 to 113 degrees. If the air temperature goes to ninety or 100, there is a slight reduction in lumen-per-watt output, actually not enough to worry about. But when the air temperature falls to the freezing point (thirty-two degrees Fahrenheit), the lamps



Mercury vapor and other gases in tubes of floor lamp produce cool light of various hues

produce only twenty-five per cent of normal light. By inclosing the lamps in a jacket of glass or transparent plastic, practically normal light output is obtained at near-zero temperatures. Heat loss is caused mostly by conduction, not radiation.

An ordinary forty-watt, inside-frosted incandescent lamp develops about 464 lumens, and radiates about seventy-eight per cent of the energy it uses, or thirty-one watts, as heat. A fifteen-watt warm white fluorescent lamp develops about 450 lumens but radiates only forty-seven per cent of its energy, or eight watts. Thus fluorescent lamps radiate only about one-fourth as much heat per lumen as filament types. This explains why fluorescent lighting is so comfortable to work under.

(Continued to page 148A)



WHAT HAS HE THAT YOU HAVEN'T?

WHAT DID YOU DO about that big idea? Did you work it up, present it? When he had *your* job he did . . . that's often the difference, the way the man ahead gets there. And perhaps he used a Royal Portable—thousands do—salesmen, executives, engineers, mechanics, students, teachers—for reports, letters, home courses. Royals are simple to use—with genuine office typewriter features that make perfect typing, faster, *easier than writing by hand*. Learn more about the Royal Portable—it will be a revelation to you. Use the coupon below, no obligation.

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ELIMINATE FORD BRAKE TROUBLES

Your Ford Car is listed in the so-called lower priced class but has more brake lining area and larger drums than the others. In fact as much or more brake area than all but the higher priced cars. You can have safe, sure, unflinching mechanical brakes. Install easily yourself our Simplex Floating Wedges to center the shoes for mechanical assurance with hydraulic performance. A set of four, one for each wheel, all for \$1.75. All models 1928 to 1938—Send for circular.

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HOLD-E-ZEE

Automatic Grip Screwdrivers

Hold, start and set-up screws in unhandy places. Gripper instantly released by spring action, sliding up out of way when not in use. Finest materials throughout, chrome vanadium blades; many have transparent, insulating, unbreakable handles. Models for recessed-head screws. No more expensive than ordinary screwdrivers. At auto-supply, hardware or electrical stores.

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BROS., INC.
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WORLD'S GREATEST all around ELECTRIC TOOL

**DRILLS — GRINDS — SANDS — SAWS
POLISHES — SHARPENS — CARVES**

The new **WHIZ ELECTRIC TOOL** is the handiest power tool ever made. Not a delicate instrument but a real rugged tool, equally effective for both power and precision work. Drills through 1/4 inch iron plate in 43 seconds or engraves intricate designs on jewelry. Handles any material: Metals—Woods—Alloys—Plastics—Glass—Steel—etc. Saves time. Eliminates labor. Plug into any socket AC or DC, 110 volts. Chuck 1/4 inch capacity. Ball bearing thrust. Powerful triple-sealed motor. "Worth its weight in Gold." **STANDARD MODEL**, with Normal Speed, uses 50 different accessories, instantly interchangeable. Special Introductory Price for FREE grinder, sanding disc, cutting wheels, mounted brush, polishing wheel, carrying bin, etc. **FREE** with each outfit ordered NOW. We pay postage. Will send C. O. D. if desired. **10-DAY TRIAL—MONEY BACK GUARANTEE.**

**ONLY
\$6.95
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GUARANTEED
FOR ONE YEAR**

Refined time, only \$6.95. Necessary outfit (Value \$2) includes set of drills, mounted 1 1/2 inch grinder, sanding disc, cutting wheels, mounted brush, polishing wheel, carrying bin, etc. **FREE** with each outfit ordered NOW. We pay postage. Will send C. O. D. if desired. **10-DAY TRIAL—MONEY BACK GUARANTEE.**

Special "BETTER" MODEL combines Normal Speed and High Speed in one outfit uses 200 accessories only \$8.95 complete, with same necessary outfit (value \$2) **FREE.**

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Complete assembly of window and screen. All metal, welded construction. Insect-proof and weatherproof. Waterproof, sponge rubber seal. Easily opened, closed and locked. Handsome appearance.



Easily Installed

Easy operation, with 3 different open positions. Fit snug and flush. Best materials and workmanship. Low prices for all sizes.

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**OK
KI-YAK**
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**BUILD OK-4 at Home
in a Few Evenings!**

Just out!—Mead's sensational 14 foot portable Outboard **KI-YAK!** OK-4 carries 4 adults and duffel—takes motors up to 9 H.P., oars and sail. Seaworthy. Leakproof. Biggest, lightest, strongest of its kind! You can build yours easily, quickly, perfectly at home in a few evenings from our patented, complete construction kit and save nearly **HALF!** Big money assembling, selling to others. (3 other paddle-sail **KI-YAKS** from 18 to 43 lbs. . . . also OK-2 for motor, sail, oars . . . weighs 50 lbs.) Rush dime for illustrated color circulars, Gift Oars Offer, amazing low Introductory Factory Prices!

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MIRACLE
MOTOR!**

\$79⁵⁰

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IT'S a twin! Alternate Firing! Only 21½ lbs! 2.5 N.O.A. *certified* brake h.p. at 4000 r.p.m.! 20 big Johnson features including 360° Steering and *Reverse!* Plus distinctive smoothness, quiet and easy starting of Johnson's *perfected* alternate firing. Ten great Sea-Horses for '39. Priced (f.o.b. factory) **\$49⁵⁰** as low as



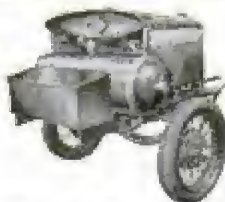
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With a Ford Motor and shop facilities you can easily assemble a Smith Air Compressor. You'll have a smooth performing, efficient compressor. Sixty cubic feet a minute capacity—all the power you'll need to operate rock drills and paving breakers. Here's a way to save money. Write for complete information.

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**New
1939
Model**



**WRITE
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Attractive—Durable—Economical, the 1939 MOTO-SCOOT is the sensation of the highways. Many exclusive features including 1½ H.P. motor, with 2 forward speed transmission, spring suspension, built in generator for lights; 30 miles per hour, 120 miles per gallon.

Thrilling—Safe—ideal for pleasure rides and business deliveries. All Moto-Scoots are available in Solo, Delivery, Sidecar and Tandem Models. Special proposition for dealers and concessionaires.

MOTO-SCOOT MANUFACTURING COMPANY
8428 South Chicago Ave., CHICAGO, ILL. U. S. A.

(Continued from page 146A)

When a room or building is being air-conditioned, the heat developed by the lamps must be taken into account. Because of the higher efficiency of fluorescent lamps, the air-conditioning engineer does not have to install equipment with as much capacity for cooling a fluorescent-lighted room as he would need if the same amount of light were being produced by incandescent lamps. With fluorescent lamps, illumination in a room can be doubled without disturbing the air-conditioning setup.

Because of the low brightness of the new lamps, which for a one and one-half-inch diameter lamp is about two and one-half to three candlepower per square inch, they can be used in the line of vision without excessive discomfort. However, General Electric lighting experts at Nela Park, Cleveland, where the new lamps were developed, recommend that the lamps be concealed. That is, for general illumination, the tubular bulbs can be placed behind a diffusing screen or mounted so that their light is reflected. For purely decorative lighting, the use of unconcealed lamps is usually not objectionable.

Because fluorescent lamps are arc lamps, the current passing through the arc would build up to damaging proportions if some sort of regulating device were not employed. Each lamp has to be connected with a ballast unit which consists essentially of a choke coil, condenser and automatic switch for disconnecting the electrodes and starting the arc. Usually these units are mounted close to the lamp. They are small enough to be placed beneath the reflector or base upon which the lamp sockets are mounted.

The rated life of a fluorescent lamp is 1,500 hours. This does not mean that the lamp will cease operating suddenly at the end of its life span. Unlike a filament lamp, which burns out in a fraction of a second as a result of filament breakage, a fluorescent lamp may continue to operate after its useful life has been exhausted. The bulb darkens gradually because of the effect of the mercury on the powder coating and the depositing of material given off by the electrodes. The useful life means the period during which a reasonably efficient light output is obtained, and during which the lamp can be started with the voltage

used. After that, it is cheaper to replace the lamp, even though it still will burn.

Every time a lamp is started there is a momentary drop of higher than normal voltage across the electrodes, which causes the active electron-producing material with which they are coated to sputter off. If the lamp is started frequently, therefore, the electrodes wear out before the useful life of the lamp has been exhausted. For this reason, fluorescent lamps in their present form are not recommended for flashing operation.

Fluorescent lamps are available only in tubular form because that is the best way to operate an arc so that it produces good fluorescence. If these lamps replace the familiar round ones now so widely used, future lighting fixtures will be wholly different from those now in use. In many respects, store owners and others who have been quick to adopt the new lamps find them more convenient to use than the older types. The slender tubes and small sockets required to hold them can be tucked beneath shelf edges, inside show-cases, mounted over desks or counters, and other places where an ordinary lamp would be too bulky.

Being an arc lamp operating on alternating current, fluorescent lamps vary in light output with alternations of the current, as do sodium-vapor lamps, ordinary arc lamps and neon signs. However, in most of the lamps the fluorescent powder is also slightly phosphorescent, so that it continues to glow after the current has dropped to zero. This serves to smooth out the flicker or stroboscopic effect. Blue fluorescent lamps show the most flicker, green very little and red and pink least of all.

The green, blue and pink lamps, as well as the daylight and white types, appear white to the eye when not in operation. The red and gold lamps, however, are colored. The lamps that appear white are coated only with the fluorescent powders, while the other two have also a dye coating to absorb some of the visible light and produce the color desired.

Popular Mechanics Magazine can furnish the name and address of the maker of, or dealer in, any article described in its pages. If you wish this information, write to the Bureau of Information, inclosing a stamped, self-addressed envelope.

Spring Brings

NEW FUN AND PROFIT to Driver Tool Owners

An old-fashioned garden gate and trellis, lawn furniture, bird houses, a boat! The many wants created by fair weather, lucky owners of Driver Tools can have for almost nothing . . . sell them to others at a nice profit, too.

Don't miss all of the enjoyable Spring projects. Driver can turn your dream shop into reality within a few days, or help you make your present shop into a "dream" with the new 1939 Driver Tools like this . . .

"TOPS" IN BAND SAWS

It's the new Model BN905—14", with a blade, traveling at 2535 feet per minute, that zips through heavy oak or a scrolled panel. It makes rip, cross-cut curved, angle or mitre cuts. Has a big 16"x16" tilting table and a lot of other features you'll like. Models from \$20 to \$67.50 to choose from. Send for the new Catalog or see local dealer. Walker-Turner Co., Inc., 159 South Ave., Plainfield, N. J.



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In your own workshop will allow you to design and build your own GASOLINE ENGINES, STEAM ENGINES, STATUARY, ART OBJECTS, SPECIAL TOOLS, NEW INVENTIONS, ETC. You can also make forgings and case harden steel. Your shop is not complete without a FOUNDRYETTE. Three sizes are available capable of making bronze castings of 1½, 3, and 6 pounds weight, aluminum, copper, brass, etc., in proportion to specific gravity. Clean scrap metal suitable for use. Each outfit includes a complete Blast furnace.

Domestic gas supply and 110 volt AC or DC Electric energy required for operation.

Size	Crucible Capacity	Shipping Wt.	Price Complete
351	6 cu. in.	25 lbs.	1½ lbs. \$13.50
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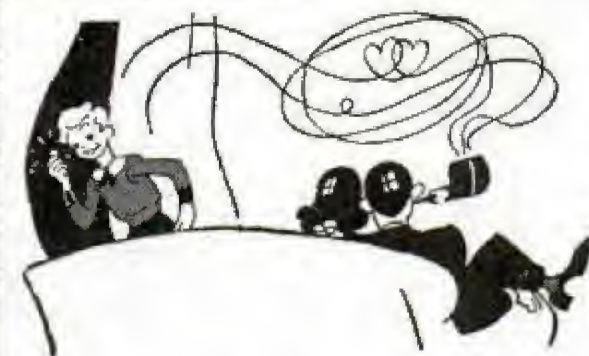
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New York to Europe by Clipper

(Continued from page 671)

seat by the starboard window, two end tables, a davenport-style triple seat that converts into berths, a combination dressing table and writing desk, a folding washstand cabinet, an occasional chair and a coffee table.

Ahead of the lounge you find another standard compartment, then a section containing a galley to the port and a men's dressing room to the starboard, and beyond is another standard compartment. The men's dressing room has a dental lavatory, two wash basins with hot and cold running water, two plate-glass mirrors and a plug-in for electric razors. The galley contains compact equipment designed by Pan American for serving full-course meals en route and an arrangement for setting up a cocktail bar between meals.

For the comfort of the passengers, the clipper has a thermostatically controlled heating system capable of circulating five times more warm air than the heating system of the modern seven-room home. There are two "furnaces" using exhaust heat from two of the four engines.

Up on the flying bridge, which is entirely lined with black to eliminate glare, will be two pilots to handle the controls on the clipper's maiden scheduled journey. Back of the bridge is the navigation and radio room, directive brain of the mighty ship. Here will be the radio officer, pilot-navigator and flight engineer, all of whom have telephone communication with the bridge. Curtained off and just behind this room is the master's office.

Actual operation of the power plant, consisting of four 1,500-horsepower Wright engines, will be supervised by the flight engineer. Engine stations are maintained in the big nacelles, one behind each motor, and are connected to the flight deck by telephone. One panel before the flight engineer contains twenty-six instruments which serve the functions of sixty-two different indicators. Most of the instruments are dual indicators and one multiple indicator gives engine head and base temperatures at sixteen different points. The radio officer has charge of three transmitters and three receivers, with which he will maintain contact with land stations and ships

(Continued to page 152A)



**BUILD YOUR OWN
FACSIMILE
RADIO PRINTER**

**COMPLETE
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\$49⁵⁰**

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**GET IN ON THE
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We provide all the necessary parts carefully precision machined ready to build, packed in a special kit. Most Crosley dealers will display them. If none are convenient to you, write us.

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Accurate—carefully hardened and tempered. Complete range of sizes at your local five and ten cent store

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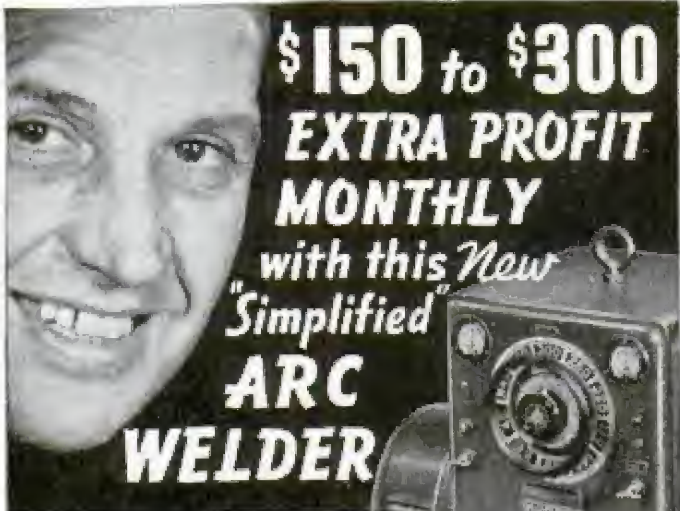
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William Moore Mfg. Co., 653 S. State, Chicago

238

(Continued from page 151A)



\$150 to \$300
EXTRA PROFIT
MONTHLY
with this New
"Simplified"
ARC
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IT'S EASY TO GET BIG PROFITS WITH HOBART ARC WELDING EQUIPMENT

Because of big profits realized with the Hobart 40-Volt "Simplified" Arc Welder you can start a big paying business of your own . . . with almost no investment! Arc welder prices are the lowest in history, making it possible for even the smallest shop to own one of these money-makers. Extra profit from a single job is often more than enough to take care of the small monthly payments. Arc welding is today's profit opportunity . . . don't miss it!

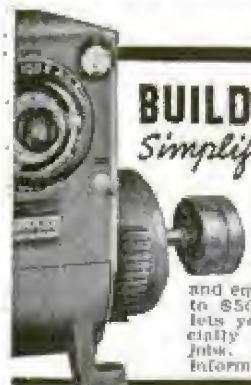
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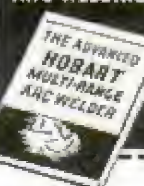


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When the Yankee Clipper—flagship of the fleet—takes the air on the first voyage, its officers will follow a carefully charted route that has been surveyed by Pan American's weather and flight experts. Many survey flights have been made by company planes, in conjunction with similar journeys made by Imperial Airways of England. On July 6, 1938, Capt. Harold Gray and his crew aboard the Pan American Clipper III crossed from Botwood to Foynes in twelve hours and twenty-nine minutes. Flying above 10,000 feet all the way, this survey crew took astronomical observations from sun and stars to make certain of bearings and picked up messages radioed from ships at sea. The clipper, which weighed twenty-two and three-fourths tons, about half that of Christopher Columbus' ship, the Nina, averaged 156 miles per hour. At the same time, Imperial Airways' flying boat, the Caledonia, flew the route from east to west in fifteen hours and twenty-eight minutes, averaging 132 miles per hour. This crossing is the more difficult because of prevailing headwinds.

Upon completion of that survey flight, Captain Gray said: "The trip was fairly easy, but it would hardly be fair to judge Atlantic weather on the basis of one journey. Nevertheless, I do not think there should be any difficulty in operating a regular service across the Atlantic."

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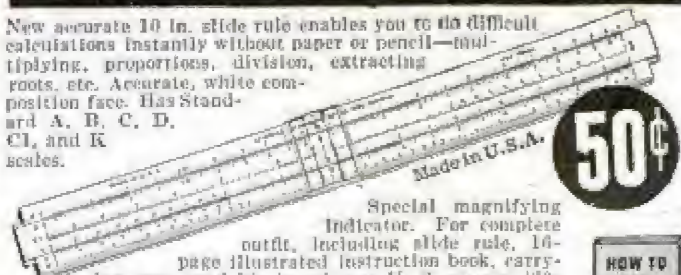
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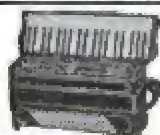
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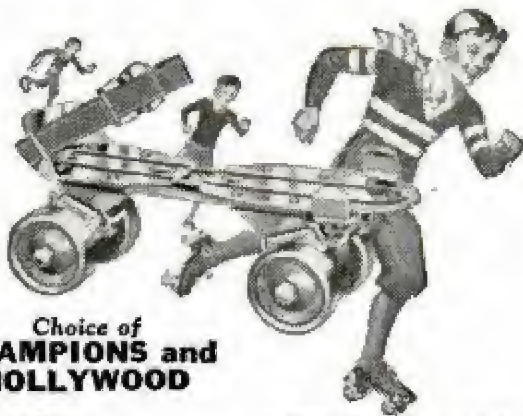
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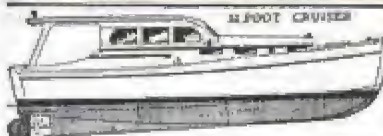
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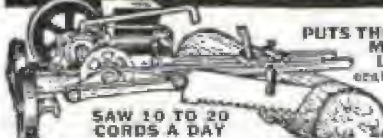


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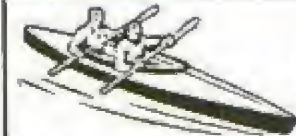
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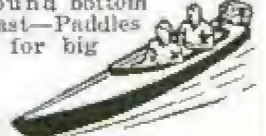


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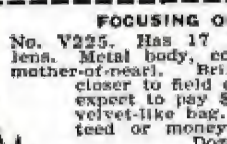
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"He told me his Willard Dealer had an instrument that could locate the trouble, so, after work that day I went over. With his *Electrical Check Instrument* he discovered that undersize cables were causing the starting motor to draw so much 'juice' it starved the ignition system.

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This new *Willard Starting Service* protects you against these hidden flaws—saves you money—saves you trouble. Let your Willard Dealer "x-ray" the starting system of *your* car—under actual load conditions—with his *Electrical Check Instrument*.

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The day of Richard E. Waggener, leading television engineer, is full of complicated problems. He welcomes pleasant leisure moments spent with mild, rich-flavored Camels. He says: "It's a comfort to

LET UP—LIGHT UP A CAMEL!"



1 A TELEVISION BROADCAST is all set to start—time for everyone to be cool, steady. Engineer Richard E. Waggener of Philco (left) passes his Camels to Katharine Aldridge and Shane Kelly. All welcome a mild, good-tasting Camel. "Easing off to let up—light up a Camel is a grand way to lessen nerve strain," says Dick Waggener.



2 ON THE AIR! The eye of television is an amazing scanning beam that zigzags over a scene 13,000 times per second. Reception is remarkably clear, thanks to engineers who forget the clock as they work. Many of these experts are Camel smokers. They find a pause and a Camel a delightful way to smooth out the rough spots of busy days.



3 A HOME RECEIVING SET: Mrs. Dorothy Temple is taking in the televised show while she enjoys a Camel. Mrs. Temple finds Camels an important contribution to the pleasure of living. She says: "Camels have a wonderful mildness. I find a pause and a Camel soothing to my nerves."



4 "MY JOB CALLS FOR intense concentration," says television engineer Waggener, "and that might mean a lot of nerve strain if I didn't take it easy now and then to let up—light up a Camel!" For real smoking pleasure, let up—light up a Camel—the cigarette for mildness—for rich flavor!

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... AND SO IS HE!



Above—the Harlequin Great Dane relaxing. Although the dog's nerve system is high-keyed like our own, when he tires, he halts *instinctively!* We are apt to keep going long past the capacity of our nerves. Rest your nerves. Do it pleasantly. Pause now and then—LET UP—LIGHT UP A CAMEL! There's a world of comfort, pleasure in milder, richer-tasting tobaccos. And smokers find Camel's costlier tobaccos are soothing to the nerves.

